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ABSTRACT

This document contains the final report and appendixes from a project to develop resources for use by community college agricultural education instructors in better utilizing computer technology in instruction and to provide inservice workshops to make the instructors aware of available hard- and software. The four-page narrative lists objectives, activities, and conclusions. The major appendix is the product, Microcomputer Resource Guide for Agriculture. Developed to serve as an introductory text for microprocessors and software index for agricultural programs, the guide provides descriptive explanation of microcomputers and their related software. Hardware selection criteria are discussed. A computer program index file using the Agdex subject titles lists more than 100 application software programs for agriculture in these areas: field crops, horticulture, forestry/natural resource, animal science, soils, diseases and pests, agricultural engineering, and agricultural economics. Each program entry provides this information: subject/enterprise, computer level, language, cost, computer type, mode of transfer, program title and description, references, authors, and specific comments. Some appendixes contain lists of user groups and microcomputer manufacturers, references, and glossary. Other appendixes include workshop materials and evaluation instruments and results. (YLB)

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FINAL REPORT

Inservice Workshops on New and Emerging Agriculture/Natural Resources Occupation Instructional Materials

Subpart 3 - Curriculum Development

ID No. CC-3-0-353

University of California, Davis

Department of Applied Behavioral Sciences

Dr. J. Leising, Russell Wilkins

Inclusive dates: January 1, 1980 to June 30, 1981

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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I. Project Objectives

A. Through a statewide community college survey and consulting with the specialist in Agriculture/Natural Resources in the Chancellor's Office, a curriculum need will be identified and a target course will be approved by an advisory committee, comprised of equal number of both sexes, currently teaching in community colleges. (Our research indicates that Animal Science appears to be a viable target area, however, due to the versatility of mini-computers, other subject matter needs can be addressed).

B. Develop instructional and laboratory curriculum (manuals) for the identified instructional area in agriculture utilizing statewide advisory input and computer technical consulting.

C. A committee is to be established to edit the newly developed materials and the content of inservice workshops in order to insure that they are free of sex discrimination, sex stereotyping, race discrimination and race stereotyping.

D. Evaluation instruments will be developed that show current usage of the manual and material as well as its overall effectiveness.

E. The statewide dissemination and inservice of the materials will be accomplished through three (3) regional workshops, during the months of January and February, 1981. Planning and implementation will be designed to address description of how materials can be used to serve the needs of the disadvantaged, handicapped, limited English-speaking students and non-traditional students.

II. Project Activities

A. A statewide survey of all Agricultural Departments in California Community Colleges was conducted. The survey detailed microcomputer availability, usage, instructor competencies, instructor needs and application and software availability. The survey provided baseline data, as well as information for subsequent planning.

B. An advisory committee was established comprised of four community college agriculture instructors, one individual from the University of California Cooperative Extension, three staff members from the Department of Behavioral Sciences, U.C. Davis, and one agricultural specialist from the community college division.

The advisory committee performed the following:

1. Reviewed initial findings of survey.
2. Recommended activities and developments for the project.
3. Reviewed all planning of each stage of project.
4. Recommended dates and locations for the statewide workshops.
5. Reviewed all registration and dissemination procedures.

Minutes of Committee meetings are included in Appendix A.

C. Developed a resource guide entitled "Microcomputer Resource Guide for Agriculture." It consisted of introductory information concerning hardware and software, computer nomenclature, and manufacture[illegible]ces and offerings. In addition, the guide lists over a hundred ap[illegible]ca-tion software programs for agriculture (See Appendix B).

All participants in statewide workshops and each community college agriculture department received one copy. Fifty copies were given to the Chancellor's Office of Community Colleges.

D. Statewide workshops were given on January 10, January 17 and January 24, 1981. The locations were Canoga Park and Sacramento. Pre-registration enrollment was used while every attempt was made to include all interested parties. (Pre-registration form and initial workshop agenda--see Appendix C.)

The workshops' agenda included: computer orientation, microcomputer hardware/software discussions, "hands-on" usage of computers, illustration of computer-assisted and computer-managed instructional techniques, and application of software for agriculture (Appendix D).

E. Formative evaluation was accomplished through evaluation instruments applied at the close of each workshop (see Appendix E).

F. A summative evaluation instrument was developed for a five-year follow-up process (Appendix F).

G. Copies of all curricular materials and evaluation instruments were delivered to the Chancellor's Office, Division of Agriculture/Natural Resources. Fifty copies of the Resource Guide and 100 evaluation forms were delivered.

III. Objective Variances

A. One of the preliminary objectives in this project stated that computer-related curriculum materials in Animal Science would be developed. However, the survey indicated that all subject areas were in need of development in addition to a severe computer knowledge deficiency existing among the agriculture teachers. Consequently, introductory computer-related curriculum materials and a broad subject base of software were developed and presented.

B. The advisory committee was originally scheduled to meet three times: first, to provide initial direction for the project; second, to edit and review the developmental plans; and third, to review the final overall program and to provide follow-up accomodations.

The committee met twice while the third meeting was cancelled. There are two reasons for the elimination of the third meeting.

1. All members of the advisory committee attended the workshops and received copies of the developed curriculum materials. Further, all individuals had an opportunity for evaluative input through the formative evaluation instruments available at each workshop.

2. Discussion with the members of the committee revealed that any additional meetings were unnecessary and that recommendations for further activities were already submitted.

IV. Implications

As a result of this project the following improvements will be achieved in Agricultural Education in California Community Colleges.

A. Instructors possess a fundamental, working knowledge of microcomputer operations.

B. Instructors possess a resource guide that offers basic computer information, as well as directories and agricultural software.

C. Instructors appreciate the potentials for microcomoputer in Agricultural Education. Further, instructors possess the awareness of how comnputers can enhance education directed toward the disadvantaged, handicapped, limited and non-English speaking and non-traditional students.

D. Instructors have a working knowledge of computer-related materials acquisitions and implementations.

V. Dissemination

A. Three computer workshops were given. One in Canoga Park, California, on January 10, and two in Sacramento on January 17 and 24.

B. Each participant received individualized inservice in addition to receiving a copy of the microcomputer resource guide.

C. All agricultural education departments not having attended one of the workshops were mailed one copy of the resource guide.

D. Fifty copies were given to the Chancellor's Office, Division of Agricultural/Natural Resources, California Community Colleges for further distribution.

E. Each of the four state universities having agricultural education programs were mailed a copy of the resource guide.

VI. Evaluation Reports

A. An evaluation instrument will be given to the Community Colleges Division. The evaluation instrument will provide a summative assessment of the effects the project curriculum materials and the inservice workshops had on computer-based Agricultural Education in California Community Colleges (Appendix F).

B. Internal formative evaluations were utilized in all workshops (Appendix E). Following each workshop the evaluations were compiled and tabulated. The comments and categorical ratings provided direct input into the adaptive processes designed to improve the dissemination efforts.

VII. Conclusions

The following are recommendations to all parties embarking on a similar project.

A. It is recommended that any inservice workshops on microcomputers should be given over a two-day period of time when being offered to beginners. The first day should focus on simple machine operations, nomenclature and computer theory. The second day could consist of applications in all subject areas of agriculture.

B. Provide all participants with information and curriculum materials prior to workshops.

C. No more than two individuals per computer during workshops.

D. Future projects should focus on computer-assisted and computer-based instruction techniques and agricultural courseware development.

APPENDICES TITLES

A. Minutes of Microcomputer Advisory Committee

B. Microcomputer Resource Guide for Agriculture

C. Workshop Registration Forms

D. Workshop Agendas

E. Internal Formative Evaluations

F. Summative Evaluation Instrument

G. Attendance at Workshops

Appendix A. Minutes of Microcomputer Advisory Committee

June 5, 1980

THE MINUTES OF THE MICRO COMPUTER PROJECT ADVISORY COMMITTEE

Serge IV Room 405

May 28, 1980

In attendance*

*Mark Bender	Ben Norman
Bill Burrows	*Jim Porter
Bruce Jensen	*Orville Thompson
*Jim Leising	*Russell Wilkins
*Ralph Matthews	*John Wolfson (Guest)

The First meeting of the Micro Computer Project Advisory Committee for California community colleges was called to order by J. Leising, Project Director. J. Leising gave a brief overview of the project and stated that the primary purposes of the project are to develop resources which could be used by community college instructors in better utilizing computer technology in instruction and to provide inservice workshops to assist community college instructors in becoming aware of the hard and software available.

Following this brief introduction, R. Wilkins presented a discussion of the card programmable calculator (TI 59) and showed some of the available programs which could be utilized in agricultural instruction. Following R. Wilkins' discussion, J. Wolfson, Vet Med Extension, discussed the general state of the art of micro, mini and main frame computers. Specifically, the group had an opportunity to view the TRS 80, Radio Shack micro computer and observe some of its capabilities. Following the discussion of current computer technology, J. Leising asked each of the community college representatives to provide input regarding the needs of community college instructors regarding computer technology. It was evident from the discussion that followed that the biggest problem with current technology is that many programs are available that can be utilized only on specialized equipment and, therefore, must be translated. This translation is very difficult and, currently, community colleges do not have programmers to carry out this function. It was also pointed out that an index of soft ware materials available for the card programmable calculators and micro computers would be helpful. Both community colleges represented mentioned that computer access was no problem on their campuses and that their colleges had available 10-25 computer terminals that could be used for instruction. It was felt by the group that instructors are not fully aware of the instructional possibilities that are available through micro computer technology and that inservice workshops would be helpful. As a result of this discussion of the needs of community college instructors, it was resolved by the group that the project would explore the following strategies:

1. Survey all community college agricultural programs in California and inventory the type of hard ware/soft ware and computer accesses that are available.

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2. Begin development of an index of soft ware materials that are available in the U.S. for use with the card programmable calculator and micro computer.

3. Begin to develop an outline for two or three inservice workshops that would be conducted in January or February of 1981, the purposes being to provide awareness and motivation to instructors through demonstrations of agricultural programs that are applicable to community college instruction. Assistance from the computer industry will continue to be explored.

4. It appeared from the discussions that the TRS 80 micro computer is currently the most popular on the market and the group felt that we should explore the possibility of developing an example instructional program to be used at the community college level.

The next meeting of the Advisory Committee is tentatively set for July 22, 1980 from 1:00 to 4:00 at U.C.D. Several members of the Advisory Committee will be attending the C.A.T.A. conference. I would appreciate any input that you could glean from colleagues at the community colleges regarding the direction that this project might take to better meet their needs.

James Leising, Project Director

JL:ns

July 31, 1980

MINUTES OF THE MICRO COMPUTER PROJECT ADVISORY COMMITTEE

Rm. 117, AOB IV, July 28, 1980

Mark Bender	Ralph Matthews*
Bill Burrows*	Ben Norman*
Bruce Jensen*	Orville Thompson
Jim Leising*	Jim Porter
	Russ Wilkins*

*In attendance

The second meeting of the Micro Computer Project Advisory Committee for California community colleges was called to order by Dr. J. Leising, project director; J. Leising reviewed the minutes of the May 28, 1980 meeting. The committee approved the minutes.

Following the brief introduction, R. Wilkins reviewed the survey report of community college agricultural department computer soft and hardware inventory. (See pages 8-13 of the summary for implications and conclusions regarding the survey information.)

The committee discussed the implications following the survey report. Several implications were reinforced by the committee members. Most noteworthy were:

1) instructors need inservice of basic computer usage.
2) expenses that instructors incur by attending inservice workshops should be offset by community colleges.
3) inservice workshops should offer varied subject matter programs as instruction.
4) computer hardware should be in the immediate building of the agriculture department.

Next, the Advisory Committee reviewed the format ideas for the software resource index. Ben Norman stated that USDA, as well as other groups, have completed indexes similar to our aims. R. Wilkins pointed out that the index should encompass as many user programs as possible. Further, provision should be made to update the index periodically. Ben Norman added that comments directed at program documentation should be included in the index format.

Index format then appeared satisfactory. The resource index will encompass all ag subject matter areas, following the Agdex filing system.

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The Advisory Committee reviewed and discussed the suggested outline for the inservice workshops. Their recommendations were:

1) that all the workshops be given in January;
2) the Northern workshop be held at U.C. Davis, the Central in the Visalia area, and the Southern at Mt. San Antonio College;
3) specific dates would be researched by Bruce Jensen, Ralph Matthews and J. Leising to report back for planning inservice dates;
4) inservice workshops should be directed at varied subject matter areas;
5) the "hands-on" operation of the computer is to dominate the agenda;
6) Ralph Matthews will develop funding sources handouts for the workshops;
7) attendance should be open to all agriculture instructors;
8) preregistration for workshops should be maintained.

Possible development of a model community college instructional program via the TRS-80 micro computer was indicated by the survey and suggests that future consideration be given to this concern.

The Advisory Committee will not meet until February, 1981. Review of final inservice programs will be enacted by mail. Final evaluation and recommendation and future projects will be discussed in February, 1981.

Advisory Committee members not in attendance are urged to review the materials and submit their recommendations.

The resource index is currently being developed and we would appreciate any agricultural software being forwarded to U.C. Davis.

R. Wilkins

Russell Wilkins
Research Coordinator

RW:ns

Appendix B. Microcomputer Resource Guide for Agriculture

INSERVICE WORKSHOPS FOR NEW AND EMERGING AGRICULTURE/NATURAL RESOURCES OCCUPATION INSTRUCTIONAL MATERIALS[1]

"MICROCOMPUTER RESOURCE GUIDE FOR AGRICULTURE"

Dr. O. E. Thompson, Director

Dr. James Leising, Director

Mr. Russell Wilkins, Coordinator

Agricultural Education Program

Department of Applied Behavioral Sciences

University of California, Davis

January 1981

[1]This project is a joint effort of the University of California, Davis and the Chancellor's Office of the California Community Colleges. Support for this effort came from P.L. 94-482, Subpart III funds (CC-3-0-353).

Project Advisory Committee

Mark Bender, Modesto Junior College

Bill Burrows, Shasta Junior College

Bruce Jensen, College of Sequoias

Ben Norman, DVM, Veterinarian Medicine Extension, UCD

Jim Porter, Santa Rosa Junior College

Ralph Matthews, California Community Colleges

Consultants

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Illustrator

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Table of Contents

		Page
	Introduction	iv
I.	Section I: Hardware/Software	1
	Hardware	1
	Software	6
II.	Section II: Hardware Selection	17
	Microcomputer Comparison Tables	27
III.	Agricultural Programs Subject Index	Tab No.
	Crops	100
	Horticulture	200
	Forestry	300
	Animal Science	400
	Soils	500
	Disease and Pests	600
	Engineering	700
	Agricultural Economics	800
IV.	Appendix	
	A. User Club Directory	A-1
	B. Microcomputer Manufacturers	B-1
	C. References	C-1
	D. Glossary	D-1

List of Tables

Table 1.	Program Languages	10
Table 2.	Typical BASIC Commands	11
Table 3.	PASCAL Commands	12
Table 4.	Common PILOT Commands	13
Table 5.	TUTOR-IV Commands	14
Table 6.	Mainframes by Manufacturer	27
Table 7.	Terminals, CRTs, and Videodisplay by Manufacturer	28
Table 8.	CPU and Memory by Manufacturer	29
Table 9.	Floppys by Manufacturer	30
Table 10.	"Packaged" Systems by Manufacturer	31

Introduction

In recent years, technological developments have provided education with innovative audio/visual support for the classroom. Reduction in size and weight of video cameras and videotape decks have provided educators with a means of bringing reality to the classroom. Hand calculators, once priced beyond the reach of most institutions, are now expanding the scope of problem solving and simulations in mathematics and other subject areas.

What will likely be viewed in the future as a milestone in technological development and as a major factor in all aspects of our society is the development of the microprocessor. Microcomputers are serving the needs of society in data handling and storage, personal finance, development of statistical projections, environmental controls, and personal information acquisition.

Unfortunately, the computer has made slow progress in addressing the needs of educators. This has been due to the high price of systems and the subsequent lack of commitment to the development of educational software. However, in recent years, advances in the microcomputer chip, large scale integrated circuit manufacturing, high level language computing capabilities, and the reduction in cost have contributed to the growing interest of the educational community. As a result, educators have begun to understand the full capability of the microcomputer for problem solving, drill and practice, simulation, and test construction. Also, continuation education and special education find the computer directly applicable to remedial and enrichment types of individualized instruction. Instructors too are finding much use for the computer in data files, maintenance, information acquisition, and general departmental management.

A survey of California community college instructors was conducted in June and July, 1980 to determine the status of microcomputer usage and instructor knowledge. It was found that 14% of all California community college agricultural departments had a computer terminal for their use. Only 5% had a microcomputer, while the other 9% had hand calculators or terminals to larger systems. Thirty-six percent of the departments had some form of a computer program for agriculture, while less than 10% of all agricultural instructors could use those programs or had a working knowledge of computers or computer language.

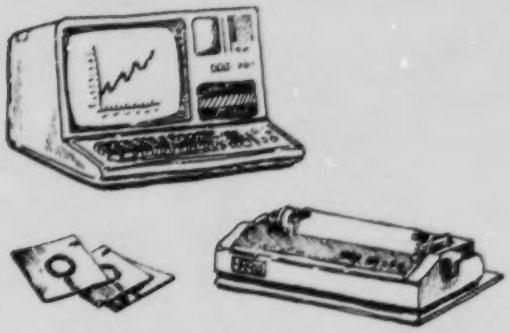
It was apparent that in order to best serve the immediate needs of instructors, introductory materials and representative samples of agricultural computer programs coupl-

ed with introductory computer workshops should be developed and presented. The Microcomputer Resource Guide for Instruction in Agriculture is one component of this effort.

The Resource Guide was developed to serve as an introductory text for microprocessors and software index for agricultural programs. The text provides descriptive explanation of microcomputers and their related software. In addition, selection criteria, descriptions of data files, networks, user groups, computer languages, a glossary of terms and selected bibliography are included. Finally, a computer program index file using the Agdex subject titles is provided. This index includes more than 100 agricultural programs such as: Animal Production, Forestry, Ornamental Horticulture and Agricultural Mechanics. This guide is assembled in such a way that new programs can be inserted by the user.

It is important to understand that the majority of these programs were developed by users such as yourself and often lack suitable documentation. However, the programs provide a much needed foundation for further development of software related to agriculture.

It is our hope that the Guide will increase understanding of microprocessors and their use and will serve to stimulate agricultural educators in becoming more involved in the further development of software for instructional purposes.



SECTION I

Microprocessor Hardware

Let us define a microprocessor. The term has different meanings to different people. To a computer engineer, a microprocessor is a computer on a single integrated circuit chip. These chips are used in many different systems ranging from toys to large mainframe computers. To nontechnical personal consumers and users a microcomputer is a small, stand-alone computer with memory, cassette or diskette, keyboard, and television screen (CRT).

While others may use different definitions of the term "microprocessor," we will use the latter meaning above. Examples of microprocessors include the Radio Shack TRS-80, Apple II, Commodore PET, and Compucolor systems.

Hardware

A computer system consists of both hardware and software. Hardware is the physical equipment and their functions, whereas software is the programmed instructions which control the hardware. In the complete sense, software also includes all documentation describing the programs and their related operations.

The hardware of a computer system consists of 5 parts. They are: central processing unit (CPU), internal memory, mass storage, and input and output devices.

Central Processing Unit (CPU)

The heart of a digital computer is its CPU, or central processing unit. It is often referred to as the "brains" of the computer. The CPU controls its overall functions, performs logical operations, arithmetic functions and issues orders to other parts of the

computer system. The typical CPU is able to perform hundreds of thousands of these operations per second.

There are several different CPUs marketed. The most common are the Z-80, MCS6502, and Intel 8080. They are generally equal in speed and efficiency. They each have specific languages and operations characteristic to the developing company. Manufacturers of microcomputers choose a CPU which best fits their systems. Radio Shack uses the Z-80, Apple uses the 6502, and Compucolor uses the 8080. In general, the various CPUs are equally distributed among the current microprocessing systems. Furthermore, some manufacturers offer more than one CPU "chip" for consumers. For example, Apple has recently offered a Z-80 for their Apple II system to enhance portability of software.

Internal Memory

The internal memory contains instructions telling the CPU what to do as well as data to work with. These instructions are known as programs and are either supplied by the manufacturer or supplied by the user. Two types of internal memory can be distinguished: ROM and RAM. ROM (read-only memory) contains programs written by the manufacturer and installed in the factory. ROM programs are permanent and cannot be changed or destroyed. ROM programs are known as "firmware." RAM (random access memory) can be changed by the user. When the system is turned off everything in RAM is forgotten. Whenever a user writes a program, it is stored in RAM. RAM programs are called "software."

An example will help illustrate the difference in RAM and ROM use. The TRS-80 Model I uses the level I BASIC language. The user writes a program and stores it in the RAM. The utility program residing in the ROM since factory installation enables the computer to understand the RAM program. The firmware interprets the written program into instructions that the CPU will understand and helps control the timing and respective functions of the various components. With the RAM program the user tells the computer what to do, while the ROM "firmware" instructs the CPU in how to do it. The user is programming the RAM whenever he writes a program. The user cannot change the firmware in ROM without physically replacing that part of the memory.

Mass Storage

Above we were describing the internal memory connected to the CPU. There is another type of memory called mass storage. Mass storage is used for keeping permanent copies of programs. Before the computer can use programs on mass storage, they must be transferred

into RAM. Mass storage can hold many times as much information as RAM, but is typically 1,000 times slower.

Mass storage is also used to execute large, complex programs which do not fit in RAM. In this technique, known as "overlaying" or "chaining," a small piece of the program resides in RAM at a time. Other parts of the program are read in from mass storage as needed. Thus, the external memory is responsible for the true expansion of the microcomputer. The external mass memory can be used to store, edit and present programs to the computer.

There are several types of external memory devices; cassettes and disks being the most common. Currently, cassette tapes are the most common mass storage found with personal computers. Most component computer systems include a cassette and their interface units in the base price. There are two distinct divisions of cassettes: audio cassettes and digital cassettes. Both systems provide considerable storage capacity, however, neither provide advanced speed of transmission or time of access when compared to discs.

Floppy disks are the second most common mass storage device, rapidly overtaking cassettes. Although disks are more expensive, they load and unload 500 times faster than tape. Also, usually only a single program can be stored on a cassette.

One 5 1/4" diskette can store five times more data than the standard internal memory. Since floppy disks are interchangeable, they are also useful for receiving programs from the microcomputer manufacturer or from others. Usually, microprocessor systems come from the manufacturer with an initial set of floppy disks which contain the software needed to run the system. Disks, being of such importance, will receive additional description during the selection criteria section.

Input and Output Devices

A computer system would not be complete without some means of communicating with its environment. Several devices exist to input information, record data files, talk with other systems, visually display input and output information, and store information files.

We discussed storage devices as a means of externally storing mass information, disks and cassettes being the most commonly found units. In addition to storage, cassettes and especially, disks serve as an input source for data and instructional programs.

One means of storing information is in hard copy form: printed. Printers are being manufactured especially for the microcomputer market. They range in quality of printing,

speed of printing, and price depending upon the needs of the consumer. Word processing systems generally require high speed, high quality printing and prices go up accordingly. Other users have little need for high speed or quality, rather they need a dependable line printer to generate readable, accurate information with little maintenance or overhead. Prices of these printers are considerably less.

A means to input information and instruction into the computer is via a terminal keyboard. Keyboard terminals vary in several characteristics such as number of keys, numeric key pads, special function keys, user programmable keys, color or graphic keys, painting or engraving of keys, and key touch. There are keyboard terminals that are physically attached to video display units and those that are not. Further, terminals may vary with respect to interface programs. Some terminals have encoded keys (keys that have specifically defined effects) while other terminals allow more flexibility in user definability.

Video displays, commonly referred to as CRTs (cathode ray tubes) are essential parts in microcomputers, especially those used for educational purposes. Some manufacturers do not include a CRT with their microprocessor systems such as Apple Computer Inc. Most companies do include a CRT in their "packaged" systems, however. Video units display what is being entered from the keyboard, that which is stored in memory or the output of a solution. CRT units vary in size, color, and glare from the outer screen. Video displays vary consideraly with such characteristics as characters per line, number of lines on the vertical screen, dot matrix, scrolling, graphics and resolution, although such factors are actually controlled by the programmed video display package residing in other sections of the system. Consequently, within a given CRT, all the aforementioned attributes can be varied within physical limits of the video display unit if the manufacturer provides the necessary "firmware" packages.

Other input-output devices that are commonly associated with certain microprocessing systems can be categorized as "specialty" devices. The list includes such items as light pens, analog/sensor input devices, graphic tablet and modems.

Light pens allow a user to select the correct answer of a question displayed on the video screen merely by touching the pen to the screen on top of the respective letter or number. The light pen is also used to draw on certain screens and boards.

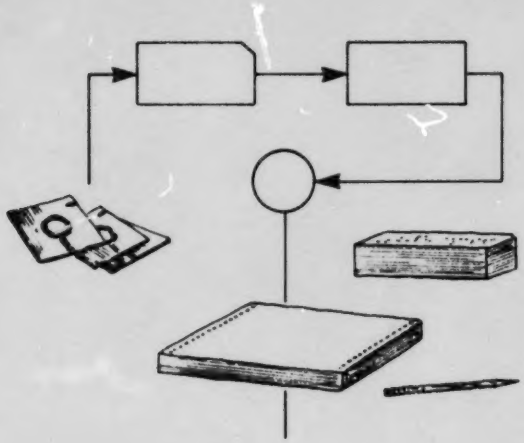
Analog sensors allow the computer to monitor external sites such as a light switch or heat sensor. These devices serve then in controlling external devices or simply by moni-

toring input data and storing for later review.

Graphic tablets are special tablets that allow the user to physically define a graph, schematics or any other feature that is sent into the computer, stored, video displayed and possibly mathematically defined. Apple Computer markets an inexpensive tablet while other more expensive units are marketed by other manufacturers.

Modems are devices that allow computers to "talk" with other systems over phone lines. Coupled with the RS232C serial interface, modems afford binary transfer of information from one computer to another. All computer systems should have at least one RS232C for this purpose.

Although our list of input-output devices does not include all available peripheral devices, the most commonly found units have been included. The specific, technical discussion of each part of a computer system will be represented in the selection criteria section (Section II), later in The Resource Guide.



Microprocessor Software

The term "software" encompasses a tremendously large area of information. Software includes such topics as program definition, languages, uses of different languages, portability, and transcription. In this section a general overview will be presented explaining what programs are, and what they do. Further, this section will describe how a program is transcribed so that the central processing unit can understand command words such as LET, GO TO, and RETURN. In addition, the different languages and their respective optimum usage will be explored. Here, such languages as TUTOR, PILOT, BASIC, and PASCAL will be briefly described and contrasted. Finally, the major concern of portability will be discussed. Included will be explanations concerning compatibility factors, special operating programs and the general differences between BASIC programs from various microcomputer systems.

Program Definition

A program is a means of solving a problem. The problem might be a series of mathematical expressions or a data base management file system. Just as a human might log inventory in ledgers, and a mathematician "manually" calculates the solutions to equations, the computer program directly replaces the human computer in these functions.

Each problem requires a different program. Each problem has its unique factors and requirements, just as chefs have specific recipes for special dishes or a particular engine has particular tolerances. There are many types of programs. There are programs previously written that solve a general problem and can often be used. An example of this type is the control program for the internal computer system. This program would be

stored in ROM memory, thereby controlling the "housekeeping" functions of a computer. Other program types include source programs that sort, file, monitor, solve equations and the like. There are programs that illustrate data in graphic display, play games, and "talk" in speech communication modes. There are programs that write other programs, interpret, assemble and translate between languages. In essence, there is a special program for every level of problem encountered.

Another definition of a computer program is as follows: a computer program is a statement in some well-defined language of an algorithm, a step-by-step procedure for solving a problem that terminates after a finite number of steps. Programs can describe highly complex, imprecise, natural language situations in such a way that their implications can be precisely calculated.[2]

Transcription

Prior to discussing such topics as languages, operating program systems, and portability of software, we need to explain the process that a program experiences inside a computer.

In the computer, information is represented as strings of binary digits (0's or 1's) that are stored in the large array of gates, or electronic switches, that make up the memory. What makes computers conceptually different from other machines is the fact that these binary strings can be interpreted as instructions as well as data. In other words, the computer controls its own course of action. The built in functions of the computer not only include the standard arithmetical and logical operations for combining and comparing stored data but also control functions that determine the sequence in which the stored instructions are executed.

The earliest computer programs were written in a rudimentary system of notation called "machine language." In machine language each basic machine operation is represented by numerical code that invokes it in the computer, and each memory location is represented by its numerical address. Later, the numerical codes of machine language were replaced by the mnemonic codes of a slightly higher-level language called assembly language. A separate program called an assembler was employed to transcribe assembly-language instructions into the machine codes that could be executed directly by the computer.

Machine language and assembly-language are detailed and repetitious, dealing with

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[2] Jerome A. Felderan, Programming Languages, Scientific American, October 1979.

such functions as allocating memory space, moving data around and invoking other such basic operations. Writing such programs is a long and painstaking process. The job of programming was significantly altered, beginning in 1954, as programming languages that would now be recognized as the higher-level programming languages were developed. Fortran was first developed in 1954 as a scientific program to be followed by other program languages as ALGOL, APL, COBOL, BASIC, PASCAL, PILOT, and TUTOR.

In these higher-level programming languages the instructions are fairly complex statements, each equivalent to several machine language instructions. An illustration of this process is as follows: A high-level program in BASIC to solve the problem of adding 1 + 2 + 3...+ 10 = X is as input on keyboard:

```
350  LET  S = 0
360  FOR  I = 1 to 10
370  LET  S = S + I
380  NEXT I
```

then ----→ Assembly language, as input on keyboard:

```
XRA   A
MVI   B, 10
LOOP ADD B
DCR   B
JNZ   LOOP
```

Machine language as input on hexadecimal key pad:

```
A8   0D
0E   C2
0A   00
81   01
```

The task of transforming these high level languages into machine-executable form is now accomplished by a program called a compiler. Unlike an assembler, the compiler does not simply transcribe a program; it also analyzes and reworks it. A compiler translates a program, stores the machine-language translation in the memory of the computer, and when the compilation is finished, it initiates the execution of the machine-language version. Once a compiler program has been written for a particular language and for a particular computer, any source program written to the exact specification of that language can be run on that computer.

Often, one hears of interpreters for languages such as BASIC. An interpretive system translates a high-level language, such as BASIC, into a simpler form, which can then be executed by an interpreter program, often stored in ROM. An interpreter typically translates more quickly than a compiler but executes the result more slowly. Interpretive systems often handle errors in the user's program more gracefully than compiled systems.

Although machine language and assembly language programs can be executed faster than high-level languages, they are more tedious and time-consuming to write. Higher level languages such as BASIC let you program statements that resemble the English language.

Languages

As seen in Table 1, there are several high level program languages available. In the United States alone there are currently more than 150 programming languages employed for such diverse purposes as business and government data processing, scientific computation, planning, simulations, modeling, process control and artifical intelligence. In fact most languages were developed for specific problems and conditions. For example, BASIC and PASCAL, general-purpose program languages, were originated in order to make the teaching of programming easier. FORTRAN (the name from "formula translator") was the first well-defined program language that "speaks" in scientific, mathematical language and is still the language most widely used for mathematical calculations.

For many specific applications of computers, special problem oriented languages have been created. The area of computer based courseware is no exception, (courseware being software designed for educational purposes, having planned texts, pretests, post-tests, behavioral objectives, etc.). Tutoring languages, such as PILOT and TUTOR, are specially designed so that they contain instructions which are helpful to the courseware author and the instructional progammer. Much as PASCAL and BASIC are called high-level languages because it takes several computer instructions to carry out the intent of a single PASCAL or BASIC instruction, authoring languages such as PILOT and TUTOR are also high-level languages. Further, PILOT and TUTOR might be considered higher yet because it would take several BASIC statements to accomplish the same response as a single PILOT or TUTOR command. The following tables show typical commands of BASIC, PASCAL, PILOT, and TUTOR.

BASIC language is the most common language found operating on microcomputers. BASIC is popular because of its need for a lesser number of commands, and relative ease in learning to program in BASIC. Further, the beginning programmer can concentrate more readily on the computational problem, and less on learning the structure of the language.

Table 1

Most Widely Used Programming Languages

Language	Year	Origin of Name	Main Use
FORTRAN	1954	Formula translator	Scientific
LISP	1956	List processing	Artificial intelligence
COBOL	1959	Common business-oriented language	Business
ALGOL	1960	Algorithmic language	Scientific
APL	1962	A programming language	Scientific, modeling
PL/I	1964	Programming language I	Business, scientific
BASIC	1965	Beginner's all purpose symbolic instructional code	Education
PASCAL	1971	Blaise Pascal	Education, systems
TUTOR	1977	A tutor language	Education

Table 2 lists common commands associated with BASIC. BASIC language is not entirely the same in all microcomputers. Standardization or uniformity in programming language has not been enforced during the development of the various microcomputer systems. Each manufacturer developed their respective compiler programs comprising the common BASIC codes and their special codes. Since the compiler program is specific for the machine and for their particular BASIC language, only those source programs written in their particular commands and format will run on their machines. Programs written, carefully avoiding any "conflict" command, would probably run on any microcomputer in BASIC. However, programs written taking advantage of special conditional transfers, subroutine calls, or disk commands or graphic language will generally not run on separate systems without modification.

There are programs on large systems that can translate languages into other languages. These programs will undoubtably become more available to the user as the software demand catches up with the technology.

Table 2

Typical BASIC Language Commands

Command	Meaning
DATA	Declares numeric or character-string data for the program's use.
DEF	Defines short mathematical or character functions.
DIM	Sets dimensions for arrays and character-strings.
END	Indicates the end of the program.
FOR/NEXT	Indicates the beginning and end of a loop, and the variable to be used to control looping.
GOSUB	Executes a subroutine (a self-contained group of BASIC commands which are processed and then return control to the command following the GOSUB).
GOTO	Transfers control to another spot in the program.
IF/THEN	Checks to see whether a condition is met, then executes a GOTO.
INPUT	Reads numbers or characters from the keyboard.
LET	Calculates the value of an expression and assigns that value to storage. BASIC often limits the total number of variables or the way in which they may be given names (like "A" through "Z").
PRINT	Prints (or shows) numbers or characters on the screen or terminal.
READ	Reads data from a DATA command.
REM	Inserts a remark or comment which does not affect execution of the program.
RESTORE	Resets so that the first DATA command will be read by the next READ which is executed.
RETURN	Returns control to the command following the last GOSUB executed.

Note that BASIC concentrates on <u>procedure</u> and not on the <u>structure</u> of programs or data.

Non-Standard Additions Which Often Appear in

Popular BASICs Used on Microcomputers

ASC/CHR$	Used to convert ASCII characters to numbers, or vice versa.
CALL	Calls a machine-language subroutine.
GET	Gets a single character from the user's keyboard.
LOAD/SAVE	Used to load (or save) programs from a tape or flexible diskette.
ON x GOTO	Calculates the value of an expression, then uses that to determine where to GOTO.
ON x GOSUB	Calculates the value of an expression, then uses that to determine where to GOSUB.

Table 3

PASCAL Language Commands

Command	Meaning
BEGIN/END	Indicates the beginning and end of a block of code to be processed as a unit, or of procedures (subroutines).
CONST	Defines constants (numeric, character, etc.).
TYPE	Defines data-types which may be used within the program or procedure.
VAR	Defines variables (and the structure of files) to be used in program or procedure.
PROCEDURE	Defines a procedure and the parameters which may be passed to it.
FUNCTION	Defines a procedure which also returns a value (or result) to the calling program.
:=	Calculates the value of an expression and assigns this value to a variable.
GOTO	Allows direct branching to a label within the program. Some purists do not really consider this command to be a part of PASCAL, and many PASCAL programmers never use it.
IF x THEN	Allows a block of code to be executed (or not) depending upon a logical test of "x".
CASE x OF	Determines which of a number of alternative actions is to be taken, and does it. This is a bit like the "ON x GOSUB" of BASIC, but has a more flexible syntax.
REPEAT/UNTIL	Repeatedly executes a set of commands until a certain condition is met. It checks the condition AFTER executing the commands.
WHILE/DO	Repeatedly executes a set of commands as long as a condition is met It checks the condition BEFORE executing the commands.
FOR/DO	Repeatedly executes a set of commands while varying the value of control variable.
WITH/DO	Determines which of a number of data-structures will be used in a block of commands.

Built-in PASCAL procedures are provided to handle input and output to files of text, or to files with structures defined by the programmer. Though PASCAL does not define direct-access input/output, most implementations of PASCAL do handle it. PASCAL emphasizes both structure and procedure. In addition to "commands," PASCAL contains facilities for the definition of various data types, and file structures (none of which are present in BASIC).

Table 4

COMMON PILOT Commands

Command	Meaning
Instructions which transfer characters between the computer and other devices:	
T	Type or write on the terminal.
A	Accept data from the keyboard.
FI/FO	File input and file output.
R	Inserts a remark into the listings.
Instructions which control sequencing of the program:	
PR	Begins a new problem.
J	Jump.
U	"Use" an internal subroutine.
E	End a subroutine and return to the command following the last USE.
SJ	"Segment jump," to another independent program.
Instructions which process student answers:	
M	"Match" the student's answer against one the author anticipated.
Instructions which compute:	
C	Compute.
XI	Execute a computer-generated instruction.

PILOT is much like BASIC in that it is a simple language, easy to learn and use.

Table 5

A Few TUTOR-IV Commands

Command	Meaning
Note: TUTOR-IV has on the order of 300 to 400 different commands. As TUTOR implementation proceeds on microcomputers, a central core of commands will be used. We will profile a few of the commands which are likely to be implemented in that core.	
AT	Sets screen position, using either line and character positions, or dot-matrix.
WRITE	Writes text and numbers on the screen.
DRAW	Draws line-drawings on the screen.
CHARSET	Loads a character set, containing specially designed characters, into memory.
ARROW	Sets position for the student to answer a question.
ANSWER	Compares student answer against an answer the author says is correct.
WRONG	Compares student answer against an answer the authors says is wrong.
CONCEPT	Compares student answer, but also checks for "close" spellings and phraseology, plus matching, against vocabulary of synonymous words.
JUMP/GOTO	Branch to another part of the lesson.
A TUTOR-IV lesson is divided up into "units," or small self-contained groups of TUTOR commands. This helps compartmentalize the interactions which (when joined together) compose a LESSON.	

Portability

Microcomputer systems are unique with respect to their software development. During the early phases of computers, programming was highly standardized on the large mainframe computers. Consequently, languages such as FORTRAN I, FORTRAN IV, and COBOL are universal on all machines. However, as the software and firmware were developed for microcomputers, higher-level programming languages underwent less standardization and uniformity. Consequently, there are many special versions of BASIC and other high level languages.

Response to the relative high degree of incompatibility of programming languages has led to several methods of enhancing portability of software. Generally, a microcomputer's compatibility can be enhanced either by physically replacing the "firmware" or by reprogramming the "firmware."

It was mentioned earlier that the internal machine operations are under the direction of "firmware" stored in ROM memory. Therefore, to change that firmware, in order that the machine will "understand" another programming language, a physical addition or replacement of that ROM board can be implemented. Several microcomputer manufactuers provide ports

where special ROM boards can be added. Each board has a preprogrammed memory that interprets a special language, specific to the CPU type being employed. In addition, other speciality programs may be introduced in this manner such as special graphics, or high resolution video display modules.

An alternate method of changing this internal ROM is by providing PROM cards. A PROM card (Programmable ROM), can be programmed by the user to provide any interpretation or special functions desired. EPROM (Erasable Programmable ROM) serves in the same capacity with the additional characteristic of enabling the user to erase the PROM and reprogram it in another form. In contrast, the PROM once programmed cannot be changed.

A third method of enhancing compatibility of microcomputer languages is through standardized software interfaces. CP/M (a trademark of Digital Research) is a semi-universal software interface. CP/M is an operating system, a layer of software that masks the hardware and makes it "impersonate" a computer, defined by the CP/M interface. Once CP/M is loaded on a microcomputer system, usually from a disk input source, the details of the specific hardware actually in use becomes irrelevant to the user. The user is dealing only with the CP/M; the operating system of the CP/M provides the special internal instructions that the resident ROM would normally divert. This ability to mate virtually any microcomputer and its software is one of the main reasons of the growing popularity of CP/M.

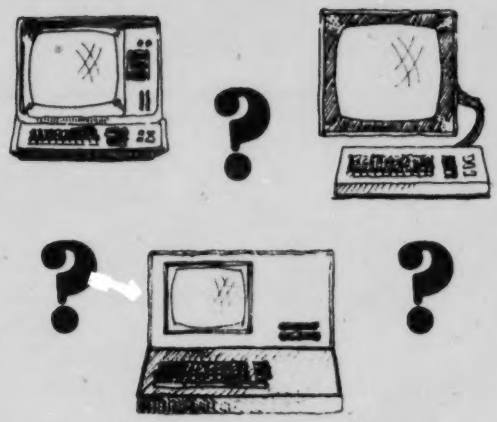
CP/M was originally developed by Digital Research for use on their 8080 CPU based systems. In 1977, Lifeboat Associates configured CP/M to work on North Star minifloppies (8") and later offered configurations for almost every other floppy disk systems--single and double density, single and double sided, hard and soft-sectored, 5 1/4" and 8", and with any disk controller. Today, CP/M is available from Digital Research, from disk manufacturers, and from distributors like Lifeboat for all 8080/Z-80 based computer disk systems sold. Four wide varieties of CP/M software are available from dozens of sources. There are application packages such as word processing and mail list programs, payroll, sort programs, and general ledgers. Recent releases include a BASIC compiler and compilers for the language "C." CP/M offers a selection among more than a dozen BASICs, three FORTRANS, three DOBOB, an APL, a PL-1 and innumberable assembler editors and business packages.

Users of CP/M systems having similar disk systems can exchange disks. Users with dissimilar disk systems can communicate program and data via telephone lines or they can

exchange listings. In addition, a CP/M disk from one system's format can be connected to another system's format by using media conversion facilities such as those offered by Lifeboat Associates.

Summary

As can be observed, software is a complex, often technical process. However, a thorough understanding of the instructions occuring in the ROM, RAM and the I/O ports will aid the user in selecting and operating systems that serve their needs. The user should first check with the manufacturer of their microcomputer for software packages that "plug in" or load in from disk, specially designed for their system. Should there be limited resources at this point, publications and advertisements in magazines such as Byte, Computer, Popular Electronics and the like offer various firmware, software and hardware packages. Finally, should the user's needs be so specific that these sources cannot supply materials, consultants in system design or software interfacing are available.



SECTION II

Hardware Selection

In Section I we presented a brief overview of the microprocessor system. The primary intent was to familiarize the reader with both the duties of each component and computer terminology.

In this section, an explanation of important decision criteria will follow an in-depth discussion of the various characteristics associated with each component.

Central Processing Unit (CPU)

As previously stated, CPU differences go largely unnoticed by the amateur user. Speed, efficiency and overall instruction sets do not significantly differ between CPUs to create a noticeable effect. However, CPUs are different with regard to the machine code they generate, consequently compatibility between systems is of major importance.

Each computer has an interpreter program which interprets the BASIC language into a coding language the machine understands. These interpreter programs are written generally without standardization or constraint. Consequently, BASIC commands are interpreted differently by various CPUs. Generally, a program written for a TRS-80, Level II machine will not run on an Apple II system. Since CPU choice is inherent in the overall micro-computer selection and the differences in CPU types cannot alone dictate the selection process, other component characteristics must be identified.

Memory

Memory is expressed in terms of bytes. A byte is an amount of space where numbers or

alpha characters can be stored. Generally, one byte will store one alpha character or two digits. Memory exists on Integrated Circuits (IC) boards, in specific size "banks," and are expressed in terms of thousands of bytes of capacity. For example, an average quantity of memory is 16,000 bytes, which would be expressed as 16K (kilo) bytes.

There are two types of internal machine memory: RAM and ROM. To review, RAM (Random Access Memory) is the memory space that can be programmed and altered as often as desired. ROM (Read Only Memory), is where special machine instruction programs are permanently stored and can not be changed. Further, the ROM program does not disappear when the machine is turned off.

Memory capacity is an important consideration when selecting a system. Depending upon the user needs and the type of programming to be applied, memory size can be determined. If the user plans to store large quantities of data such as inventories or large text files, 16K would definitely be so small as to be limiting. Some computers also store operating programs such as CP/M in their memory. The quantity of memory must be sufficient to house the operating instructions, while providing adequate working space for the source program and related data.

As a rule of thumb, 16K of RAM with the instruction programs stored in ROM would be sufficient for most programs currently written in BASIC by agricultural users. There are programs that have large inventories and text which would require up to 32K RAM. However, there are methods of "chaining" program parts together, storing the unused portions on disk and calling them into internal RAM when needed. This "chaining" process allows a user to operate with significantly less internal RAM memory.

Other user needs would dictate larger memory. For example, the use of CP/M operating software interfaces or word-processing files would require an additional 12K RAM because the programs occupy a significant number of bytes in RAM memory.

It should also be noted that some manufacturers offer operating systems and special program modules in "firmware" ROM cards that can be added onto the system as needed. This procedure avoids the purchase of expensive memory expansion packages.

As a guide, the novice user should select a system that has 16K-32K RAM and allows for expanded memory capacity in a convenient and inexpensive manner.

BUS

As a potential buyer of microcomputers you will undoubtedly hear much said about BUS systems. A BUS in a conduit for I/O devices to interface with the central unit. It

provides a means of transferring data from input devices to the central unit and from the central unit to output devices. Concerns regarding BUS systems are two-fold: Directional data flow and pin format. The BUS is capable of unidirectional or bidirectional flow of data. This means that data can flow only one direction at a time or both directions simultaneously. Depending upon your specific needs, such as speed of transmission or I/O communication modes, the type and expense can be determined.

Compatibility is the second concern in BUS terms. Busses come in a variety of pin configurations. The S-100 bus is being established as a standard bus, having 100 pins. It is used by several microcomputer systems such as Radio Shack TRS-80 units and Vector Graphic 2800 and systems B models. However, many computer companies have chosen their own bus configuration. (See CPU/memory chart for comparisons). The choice of bus has little bearing on efficiency of operation, but can limit compatibility of hardware interfacing.

Although this obvious lack of compatability in bus terminals infers considerable restraint of hardware substitution and "mixing" components, actual situations dictate that this restraint is minimal. For the average user, compatible I/O devices offered by most manufacturers are more than adequate. Again, sound advice dictates that selection of a particular microcomputer should not be based upon bus options unless the peripheral I/O devices marketed for that system appear inadequate and you anticipate interfacing different peripherals. Generally, this will not be the case, as most system packages provide adequate speed and capacity.

I/O Ports and Interfacing

One factor that is important in expansion and I/O devices is that a system "mainframe" should provide appropriate ports to "plug in" I/O devices. Because ports vary in roles and requirements, there are several types. The more important ports include ROM sockets, parallel, serial, RS232C, IEEE, and cassette and disk ports.

ROM sockets are associated with microcomputers that expand their internal memory by plugging in cards. For example, Apple Computer Incorporated markets several cards that provide special grahics, communications interface, graphic tablet input, parallel printer card, and serial cards for accessing other computers, high speed printing, telephone exchange, and musical tone generation.

Often, ports only allow I/O devices to be plugged in. The interfacing card is either in the external device, as in single disk drives of the TRS-80 disks, or inside the mainframe (included in the original package), as in the RS232C used for communication purposes.

The controlling factor is clearly defined by the I/O device requirements. If the printer is arranged to accept parallel transfer of data then the mainframe must provide a parallel port. (Parallel transfer is best explained by contrasting parallel to serial data transfer. If a "word" consists of 8 bits of data, then the parallel port would transmit all 8 bits at once--parallel, while the serial would send one bit at a time. The serial port transmits slower but requires a single wire to send data, while the parallel is fast but requires 8 wires to send all 8 bits at once. Serial transfer is appropriate for longer distance and low speed transmission).

Most microcomputer systems have all the I/O ports necessary. They differ considerably on the total number of ports of each type. Whether or not the total number of ports is consequential would depend upon the needs of the user. Some systems offer as many as 256 ports while others offer only one of each. Still other manufacturers offer one port with a bus strap that will allow several terminals or several disk drives on a single port.

Again, future expansion and present individual needs will govern the importance of I/O ports. All computers should have at least one of each type to provide the minimum for a complete array of peripheral device interfacing.

Floppys

Disks are comprised of a driver, disk controller, read/write heads, stepper motors, write protection switch and possibly an index/sector detector and index sector LED if hand sectored. They are fairly simple devices when compared to their big brothers, hard disk devices. For the most part, how a disk system works is of little consequence except for the sector index process.

Each diskette is permanently sealed inside its jacket to prevent bending, scratching or contamination of the diskette surface. When the diskette is loaded into the drive, a hub assembly grips the diskette. When the drive motor is on, the diskette rotates inside its jacket. The specially treated jacket lining cleans the diskette as it rotates. The diskette spins at 300 RPM and a head moves in and out reading or writing information. The format of the disk surface is very important in that exact placement of data needs to be known. To accomplish this the diskettes are sectored into "pieces of pie." Also, as a phonograph record has circular tracks, the diskette surface has electromagnetic tracks. Given the coordinates of the track number and the sector number, information can be retrieved.

The number of sectors and tracks is determined by the manufacturer for their respective systems. In the case of hard-sectored disks, holes are punched into the disk and a sector sensing device determines the location of the diskette. In soft sectoring, the software disk operating system predetermines the sectioning and electromagnetic markers are placed at the beginning of each sector. To illustrate soft sectioning, Apple Computer, Incorporated, has two sectoring formats for their 5 1/4" floppy disk systems. They have a 13 and 16 soft sector/disk format; both of which are controlled by software formatting programs, 3.2 DOS version and 3.3 DOS version, respectively. This means that information written with the 3.2 DOS on 13 sector disks will not read on 3.3 DOS 16 sector disk drive systems. Five and one-fourth inch (5 1/4") disks have anywhere from 35 to 40 track/disk and are sectored into 10-20 sectors/track, while 8" disks have 70-77 tracks and 24-28 sectors.

Floppy systems are described in additional terms such as storage capacity (formatted and expressed in K bytes/disk), bytes per sector, data transfer rate (bytes/second), access time (in thousandths of a second--milliseconds), driver motor start time (seconds), size of disk, density, and number of sides written on.

In terms of compatibility with other systems, the size of disk, density, number of sides, and sectoring are critical. In terms of size, they are either 5 1/4" or 8" diskettes. Density options include single density or double density. This refers to how densely information is recorded on the diskette. It generally reflects in total storage capacity as well (K bytes). Number of sides is straight forward and contributes to enhancing total capacity in bytes/disk. Again, sectoring is critical for exchanging purposes.

When examining the various systems, one sees large variations in sectoring, density and subsequent formatted capacity.

When purchasing a system, it is well advised to attempt to optimize the total capacity against cost rather than compatibility or transfer rate. There are other means of transferring information between microcomputer systems using compatible DOS software and tracking diskettes. Further, transfer rates are generally adequate for most purposes in education. Total capacity is the primary intent of this mass storage memory device and consequently should be optimized where it is cost efficient.

Since floppy disk storage is a very important and costly component, it should play a large role in purchase decision. Further, additional external disk drives may be added to

expand your storage at a later date. Here, cost versus expanded K is the decision factor to be considered.

Video Display Devices

An essential component for a microcomputer system, especially in education, is a video display. The ability to show simulations, graphs, and text; to provide users feedback from programs; and to review programmed material easily can justify the purchase of a video display.

The important features of a video display include the number of characters per line, the number of lines per screen display, scrolling, dot matrix, and color.

Characters per line in video displays fall into one of three categories: those that are either 40 or 80 characters per line; those that are both 64 and 32 (controlled by a special "firmware" function); and those that are varied by "firmware" between 80 and 40 characters per line. If word processing and text editing are the primary uses of the microcomputer, having 80 characters per line is very useful. For scientific purposes and writing basic programs, 40 is adequate. However, if it is possible to obtain an 80 character per line display with little or no compromise in other system features, you should do so. The longer lines will be useful should you later decide to use your system for text processing. In systems that provide 40 characters, they usually have 80 characters but 40 do not show up on the screen. Should the information be transferred to a larger screen, all 80 characters would be in view.

Another characteristic is the number of lines per page. Screens range from 12 to 48 lines per screen. Referring to Table 7, several combinations of characters per line x number of lines are offered by manufacturers. Again, the advice is to optimize the visible screen text against cost. A minimum level of screen text recommended for education is 80 x 24. This recommendation is based on a desired area to view simulations, graphs and programs. It is especially tedious when programming courseware to require students to roll back the screen to see the program which passed out of view 15 steps ago. The less time wasted in scrolling back the easier and faster programming and learning becomes.

Matrix refers to the number of dots on the screen allotted for each character. The combinations vary but two accepted matrix patterns are 6 x 8 and 8 x 8. Within the matrix is the dot pattern provided for the character. There is generally a one dot margin provided inside the borders of the matrix. For example, a 6 x 8 matrix will have a 5 x 7 dot pattern.

In terms of selection criteria, a 6 x 8 matrix is adequate for most purposes varying from graphic display to normal text.

Color is the last of the major characteristics being considered here for CRT selection. The added cost of color may account for 15% of the retail price of the total system. Depending on the proposed uses and other computer component specifications, color may be justified.

Color simulations, color graphs, and color text can often provide a pleasing and clear presentation of educational materials. Plant identification can be enhanced for certain plants with color specifications. Irrigation simulations or engine descriptions are often best represented with color enhancements. The best advice to the user is to determine if 10%-20% extra cost for color is justified by the intended use of your microcomputer.

The second consideration is that of balancing the performance of the system, as a whole, with respect to color inclusion. Thus, you may not be prevented from buying an otherwise attractive system because it does not offer color display. By purchasing another system offering color, you may have to sacrifice other features.

In summary, if the specific applications would be justifiably enhanced by color and system performance is not markedly reduced by purchasing another system with color, then include color in your purchase.

Terminals

Terminals may be the most important item on the purchase list. Much time will be spent inserting programs, editing, commanding, and writing text. The ease of use, the key placement, the number of key options, the availability of special function keys, the "touch" or "feel" of the keys, and the shape of the key caps contribute to quality and convenience.

Keyboards vary greatly between manufacturers with special function key placement, shifted key options, and the inclusion of a 12 key numeric key pad. Primarily, key function and options are dependent upon the intended use, while key placement is a manufacturer design item. Poor key placement can quickly become a tiresome, irritating fault in the terminal keyboard. For example, on some keyboards there is a special function key for sending "blocks" of text to the machine. However, if you accidentally strike this key when programming, it sends the existing lines of program to the machine. It is a tiresome, time consuming process to regroup after such an error. Other examples of poor key

placement are the positioning of the reset key near the carriage return key and the positioning of the control key near the shift lock. This latter mistake entails printing capital "Hs" when you wanted to backspace with a control H code. Key positioning problems are difficult to recognize before purchase and usually become evident as experience is gained on the terminal. It is well advised to contact former and current users of the specific terminal regarding these types of problems.

"Touch" or "feel" of the keyboard is important for entering data or text rapidly. A crisp snap and a quick return of the key is important for accurate, fast data entry.

Terms such as N-key rollover also enters into consideration. This refers to hitting two or more keys quickly and having the terminal know in what order they should be received. While most machines have some form of key rollover, they do vary in the number of keys they will keep track of. This will be stated as 2 key rollover or N-key rollover in most cases.

The shape of the keys may become important as time spent on the terminal increases. It is generally true that sculptured shape (indentation) keys fit the finger tips better and enhance accuracy, speed, and ease in typing.

Other factors are the options of upper and lower case letters, color keys, cursor control and the presence of a numeric key pad. Certainly, the use of a numeric key pad for entering large quantities of numeric data is advisable.

Printers

Most microcomputer systems include only a video display screen for displaying text, programs, and program results. Video screens have the advantages that they do not use up paper, make no noise, and can display text at high speed. However, if you need a permanent, readable copy of some output from your system, you will need a printer.

Printers vary in copy quality, speed, and price. Since the cost of a printer can approach the cost of the rest of the microcomputer system, it is important to consider copy quality carefully. Speed is not usually important enough in microcomputer systems to justify the cost of very fast printers.

Microcomputer printers come in three varieties: daisy-wheel, dot impact, and thermal. Daisy-wheel printers offer the best output quality and have the advantage that the daisy-wheel, which contains images of the printed characters, can be changed like a selectric ball. Many different type styles are available for around $5 per daisy-wheel. However, daisy-wheel printers tend to be more expensive than the other kinds.

Dot impact printers print with a vertical column of pins which impact through an inked ribbon. The characters are printed in a dot matrix similar to that used for displaying characters on a video screen. Dot-impact printers, produce a readable, useful output, but are not of high enough quality for general word processing. They do have a reputation for reliability and are less expensive than daisy-wheel printers.

Finally, thermal printers use special heads and heat-sensitive paper to print characters in a dot matrix. The printer itself is less expensive than daisy-wheel and dot impact printers (it has fewer moving parts), but the heat sensitive paper is more expensive. Thermal printers are much quieter than the impact printers. The copy quality is comparable to dot matrix. Thermal printers work well for small quantities of printing.

In summary, one should buy the least expensive printer available for your system that will provide the necessary copy quality. For high volume printing, a dot impact printer using conventional paper will save more money, in the long run, than a less expensive thermal printer using the more expensive thermal paper.

General Remarks

In addition to knowing the meaning of computer terms, available options, and their relative importance, it is fundamental to know the factors primary to purchasing selection. In summary, it is a general rule to optimize the storage capacity of external mass storage devices against cost, optimize the display space against cost, choose a keyboard that fits your specific needs, include I/O ports suitable to your future expansion, purchase color and graphic capabilities (if they are both cost effective and enhance your displays), and if hard copy output is one of your needs you need to minimize price commensurate with required printing quality. Further, compatibility need not be too restraining as many manufacturers offer a complete line of compatible I/O devices suitable to your needs.

There are "packaged" systems, complete with memory, terminal, CRT screen, cassette and/or disk, I/O ports of all types, software and instructions. Table 10 compares some of these "packaged" systems to price.

Other important considerations in buying any item are warranty, location of repair service centers, total cost, software and "firmware" support, and inservice training and advice. It is suggested that the two most important concepts are maximizing the capacity of the selected microcomputer to satisfy your needs against cost and the location of nearby service centers. Further, by the process of elimination, the selection may be

narrowed to two or three systems equally capable in terms of your needs. Overall cost and service locations should undoubtedly influence the final selection.

Table 6

Mainframes by Manufacturer

Manufacturer	Model	Bus System	Keyboard	I/O Ports	CPU	Comments
Apple II	A2S0016	Apple 50	ASCII 64 drop key standard typewriter	8 ports, RS232C serial and parallel	6502	Compatible with Centronics printer; options: modem and graphics
Apple III	A351	Apple 50	IBM 74 key typewriter with 10 key numeric pad	4 ports, with RS232C parallel or serial	6502A	
Commodore	2001	own	standard keyboard, graphic keys, numeric pad	4 ports, incl. IEEE parallel and serial	6502	Hewlett Packard compatible, IEEE interfacing
Commodore	8032	own	ASCII standard typewriter	4 ports, incl. IEEE parallel and serial	6502	IEEE interfacing
Heath	H-8	BH 50	octal keyboard	10 I/O ports, serial and parallel	8080	
Intercolor	3621	40 pins	72 key ASCII standard typewriter	1 serial RS232C	8080A	13" CRT
Intercolor	8051	40 pins	standard typewriter ASCII with lower case	17 ports incl. 3 RS232C, 1 parallel, and 1 3-socket port	8080A	13" CRT, 256 ports interface features: color keys, numeric pad, and special function keys
North Star	Horizon	S-100	standard typewriter, numeric pad, 12 special function keys	256 ports maximum, standard 2 serial and 2 parallel	Z-80	Has 12 slot mother board for S-100=256 ports
Radio Shack	TRS-80, III	S-100	77 key ASCII standard typewriter with 12 key numeric pad	1 parallel port, 1 RS232C	Z-80	Contains 1 5.25" disk, graphic > Model I
Radio Shack	TRS-80, II	S-100	76 key standard typewriter	2 RS232C serial, 1 centronic parallel, and 1 external disk port	Z-80A	Contains 1 8" disk
Southwest Technical Products	SYSA		56 key alpha numeric keyboard, 12 key pad	RS232C serial port, 1 parallel I/O		Optional 92 character format, graphic symbols
Vector Graphics	2800	S-100	standard keyboard, numeric pad	1 RS232C, 3 parallel and 3 PROM sockets	Z-80	
Vector Graphics	System B	S-100	standard keyboard, numeric pad	2 parallel, 3 serial, 3 PROM sockets		

Table 7

Terminal and CRTs by Manufacturer

		Keyboard					Text Characteristics				Display		
Manufacturer	Model	# of Keys	Prog Keys	Cursor	Upper Case	Lower Case	Characters Per Line	# of Lines	Matrix	Scrolling	Graphics	Color	Resolution
Apple	II	64		x	x		40	24	6x8	x	40x48	15 colors 6 colors	280x192 240x192
Apple	III	Data unavailable--release expected January, 1981											
Commodore	2001			x	x	x	40	25	8x8	x	charact. yes	green	320x200
Commodore	8032			window	x	x	80	25	8x8	x	charact. yes	green	640x200
Heath	WH14	67		x	x		80	12	6x8	x	no	yes	480x96
Intercolor	3621	72		x	x	x	64	32	6x8	x	128x128 yes	8 foregrd 8 bkgrd	384x256
Intercolor	8051	72		x	x	x	80	48	6x8	x	160x192 480x384	8 foregrd 8 bkgrd	480x386
North Star	Hazel-tine 1420	95		x	x	x	80	24		x			
Radio Shack II	264001	76	2	x	x	x	80/40	24		x			
Radio Shack III	261063	65		x	x	x	64/32	16		x	charact. graphics		
Southwest Tech. Products	CT82	56		x	x	x	82	16-20	7x12	x	184x66 yes		
Vector Graphics	2800	80	no	x	x	x	80	24	7x10	x	charact.		250x240
Vector Graphics	System B	80	no	x	x	x	80	24	7x10	x	charact.		250x240

Table 8

CPU/Memory

		CPU			I/O Ports		Memory		
Manufacturer	Model	Bus	CPU	Speed in mHz	Parallel	Serial	RAM(K)	ROM(K)	Comments
Apple	II	50	6502	1.5 mHz	x	x	16-48	8-12	Color graphics
Apple	III	50	6502A	.1 mHz	x	x	96-128	4 I/O, 12 ROM	RGB 9 pin, color monitor available, resolution to 520x192
Commodore	2001	own	6502	1 mHz	x	x	8-32	14, EPROM, 3x2	
Commodore	8032	own	6502	1 mHz	x	x	32	18	
Heath	WH14	BH50	8080	1 mHz			64	1x8	
Intercolor	3621	40	8080A	.5 mHz			32	16 with 4 refresh	
Intercolor	8051	40	8080A	.5 mHz	x	x	8 refresh, 8-24 work space	24	
North Star			Z-80	4 mHz	x	x	16-64	4	
Radio Shack	III	S-100	Z-80	1.8 mHz	x	x	4-48	14	Features direct memory access and vectored interrupt
Radio Shack	II	S-100	Z-80A	4 mHz	x	x	32-64		
Southwest Tech Products	S/09	50	6809		x	x	128-34		20 bit address bus
Vector Graphics	2800	S-100	Z-80	4 mHz	x	x	56	2	High resolution available
Vector Graphics	System B	S-100	Z-80	4 mHz	x	x	56	2 PROM	3 PROM slots to Vector single board

Table 9

Floppys

Manufacturer	Model #	Price	Disk Size in"	Sector Type	# of Sectors	# of Tracks	Bus	Density	Sides	Capacity (K/disk)	Transfer Rate (BPS)	Comments
Apple	SA399	$595	5.25	S	13 (3.2) 16 (3.3)	35	50	single	1	100 (3.2) 140 (3.3)	156 (3.2)DOS 310 (3.3)DOS	
Commodore	2040	$1295	2-5.25		16-20	35		single	1	170		
Commodore	8050	$1695	2-8"		24-28	77		single	1	520		
Heath	WH17	$675	5.25	H	10	40	50			102		
Intercolor	3621	internal	5.25	S	10	40		double	2	102	76	Internal drives only
Intercolor	8051	$600	5.25	S	10	35		single	1	92	125	Optional dual 5.25 (356K); 8"(1.2Mbytes)
North Star	MDS-A-D	$899	5.25	H	10	35	S-100	double	1	740	250	Quaddensity available
Radio Shack	261162	$500	5.25	S	18	40	S-100	double	1	134-178	96	1st disc cost =$849; 2nd= $400; 3rd=$500
Radio Shack	264160	$1150	8	S	26	77	S-100	double	1	486	500	1st costs =$1150; 2nd= 1750; 3rd= 2350 or 6000
Southwest TP	D5	$1295	5.25				50	double	2	360		Dual drives
Vector Graphics	2800	internal	8"	S	IRM	77	S-100	double	2	MByte	500	Dual internal, IBM compatible

Table 10

"Package" Systems of Manufacturer to Cost

RADIO SHACK TRS-80 MODEL III: 65 key standard typewriter, 12 key numeric pad; terminal video display, 64 x 16; 1 parallel, 1 serial RS232C; S-100 bus; Z-80 with 32K (RAM); 1-5 1/4" disk (178K disk capacity) with DOS.

$1984 RAM=$7.44/K

APPLE II: 65 key typewriter; terminal, black and white video monitor; 2 hand controllers; 5 1/4" disk (capacity 140K) with DOS; 6502 CPU; RS232C serial port, parallel ports; 32K RAM.

$2234 RAM=$10/K

COMMODORE 2001: 40 x 25 video/terminal; standard keyboard, 10 key numeric pad, upper case and graphic characteristic; IEEE I/O; 32 RAM memory; 6502CPU; dual 5 1/4" single density disks (340K or 170K each capacity) DOS. Note that price includes 2 disk drives.

$2590 RAM=$18.75/K

INTERCOLOR 3621: Standard 117 keys including a numeric pad, 16 special function keys, color keys, graphics; terminal, 64 x 32 video screen; RS232C serial; 8080A CPU; 32K RAM; single 5 1/4" disk, 2 sided (capacity 102K).

$3300 RAM=$24.68/K

NORTH STAR: 95 keys, 2 special function keys with numeric pad; Hazeltine video terminal, 80 x 24; 32K RAM; 2 serial, one parallel I/O interfaces; Z80A processor; single disk (180K capacity), DOS; BASIC.

$3,690 RAM=$31/K

The above systems are standard 32K RAM, with disk, terminal and video display. The prices are based upon the most current manufacturer's price available.

Subject/Enterprise: Field Crops/Cotton/Fertilizer vs. Improvement

Code: 151.49

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References: COT3, 4
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: COT2. BAS

Program Description: Program calculates cotton yields for various fertilization rates. Rates are incremented from 0 to 250 pounds of fertilizer in 10 pound steps. Output: compares pounds of fertilizer to cotton yield.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Chains to COT3. BAS

****

Subject/Enterprise: Forage Crops/Crop Handling

Code: 120.54

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: STACK. BAS

Program Description: This program calculates the number of hay bales that will fit into a stack. Variable inputs: length, width and height of stack. Output: amount of hay bales in cubic feet, and number of bales that will fit in the stack.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Program must be rerun for new variables as no loop is provided.

Subject/Enterprise: Field Crops/Cotton/Fertilizer vs. Improvement

Code: 151.49

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: COT4. BAS

Program Description: Program prints a graph describing cotton yields for various fertilization rates as calculated in COT2. BAS.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Field Crops/Cotton/Fertilizer vs. Improvement

Code: 151.49

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References: COT2, 4
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: COT3. BAS

Program Description: Program calculates cotton yields for various fertilization rates. Variable inputs: number of pounds of fertilizer. Output: compares pounds of fertilizer to cotton yield.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Similar to COT2. BAS with exception that user determines number of pounds of fertilizer.

Subject/Enterprise: Field Crop Production/Cotton/Chemical Test Trials

Code: 151.90

Computer Level: Minicomputer

Computer Specific: PDP 1170

Language: DEC BASIC PLUS

Required Core: 16K

Cross References:

Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Cost: Negotiable

Program Title: IN2. BAS

Program Description: Program gives information on cotton crop with double treatment of N-SETT. Program outputs data, matrix style of plant height, number of plants; squares; and bolls after treatment.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Program chains to IN1, 3 and 4 to compare effects of N-SETT when used in different stages or not used at all.

****

Subject/Enterprise: Field Crop Production/Cotton/Chemical Test Trials

Code: 151.90

Computer Level: Minicomputer

Computer Specific: PDP 1170

Language: DEC BASIC PLUS

Required Core: 16K

Cross References:

Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Cost: Negotiable

Program Title: IN1. BAS

Program Description: This program gives information on cotton crops with early treatment of N-SETT. Program outputs data matrix style of plant height, number of plants, squares, and bolls after treatment.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: This program chins to IN2, 3 and 4 to compare effect of N-SETT when used in different stages or not used at all.

Subject/Enterprise: Field Crop Production/Cotton/Chemical Test Trials

Code: 151.90

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 16K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: IN4. BAS

Program Description: Program gives information on cotton crops when untreated with N-SETT. Program outputs data, matrix style, on plant height; number of plants; squares; and bolls when left untreated.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Field Crop Production/Cotton/Chemical Test Trials

Code: 151.90

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 16K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: IN3. BAS

Program Description: Program gives information on cotton crops with late treatment of N-SETT. Program outputs data, matrix style, on plant height; number of plants; number of squares; and bolls after treatment.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Program chains to IN1, 2, and 4 to compare effects of N-SETT when used in different stages or not used at all.

Subject/Enterprise: Field Crops/Potatoes/Seeding: Planting

Code: 161.22

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SPUDS. BAS

Program Description: Program calculates the number of cut spuds required for planting one acre of ground. Variable inputs: space in inches between furrows, and space in inches between cut spuds. Output: the number of cut spuds per acre. Loop is included in program to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Line 1035 needs inches to foot conversion constant for correct answer. Correct equation should be: N=43560/((F-S)/144)

****

Subject/Enterprise: Field Crop Production/General Reference

Code: 101

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 8K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: CROP6. BAS

Program Description: This is a general information only program on field crops, specifically alfalfa, oats, wheat and potatoes. Areas briefly dealt with are origins of growth, soil and climate, and planting of seed methods. Program prints out text on any one of the choices with a loop included to go back and read about another crop.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Horticultural Crops/Grapes/Seeding & Planting

Code: 231.22

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: GRAPE BAS

Program Description: Program calculates number of vines needed for one acre of grapes. Variables inputs: space between rows in feet, distance of vines in feet. Output: Number of vines per acre. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Horticulture/Citrus/Oranges and Grapefruit/Grading

Code: 220.54

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost: Negotiable

Computer Specific: Apple II
Required Core: 4K
Mode of Transfer: Hardcopy print - 41 command lines

Program Title: Fruit Quality Calculations for Oranges and Grapefruit

Program Description: Program calculates a quality index for oranges and grapefruit based upon input titration and specific gravity variables.

References:

Authors: Paul Dilger, Agricultural Department, College of Desert, Palm Desert, CA.

Specific Comments: Before student ready, internal program remarks including necessary calculations need to be added.

Subject/Enterprise: Horticulture/Lawns and Turf/Soil Treatments

Code: 273.23

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: GRASS. BAS

Program Description: Program computes necessary amount of and suggestions for fertilizers and soil amendments for lawn installation. Variable inputs: width and length of area. Output: amount of suggested fertilizers and soil amendments for given area. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Horticulture/Lawns and Turf/Seed Certification

Code: 273.43

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SEED. BAS

Program Description: Program calculates percentage of growable grass seeds from amount of live seeds. Defines purity and germination. Variable input: purity and germination percentages. Output: percent of live seeds that will germinate. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Forestry/Tree Identification

Code: 333
Computer Level: Micro and mini computer
Computer Specific: HP 2000
Language: HP BASIC
Required Core: 8K
Cross References:
Mode of Transfer: Hard copy; 170 program steps including 9 data files
Cost: Negotiable

Program Title: TREES7 - Scientific names match of trees

Program Description: Conversational matching program where the student matches the scientific name to the common tree. Computer gives the student three tries and scores the student. A final tally is given to the student at the end of the program.

References:

Authors: Sierra College, Rocklin. Perry Edwards, Bob Whilhite, Forestry Tech.

Specific Comments: Documentation is well done. REM statements identify all variables and instruct in proper method of data entry. Consequently this program can be used to serve any matching identification.

****

Subject/Enterprise: Forestry/Natural Resources/Water

Code: 390
Computer Level: Microcomputer
Computer Specific: TRS-80
Language: TRS-80 BASIC Level II
Required Core: 16K
Cross References: Using 390 coding for all natural resource software
Mode of Transfer: Cassette
Cost: $10.00

Program Title: STREAM

Program Description: Program calculates volume flow (cu. ft./sec), area of stream cross section and plots a bottom profile of stream cross-section. Input variables: multiple width/depth interval coordinates, distance float traveled downstream, time (sec), may select among subroutines for smooth or rough bottom contour.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: Graphic plot of bottom contour. Can store site # and location #.

Subject/Enterprise: Forestry/Harvesting/Selection and Cutting

Code: 355

Computer Level: Microprocessor/Mini system
Computer Specific: HP2000
Language: HP BASIC (easily modified to other strains)
Required Core: 16K
Cross References:
Mode of Transfer: Hard copy, 93 line codes simple basic
Cost: Negotiable

Program Title: BATHIN--Basal Area Determination and Thinning Guidelines

Program Description: The primary objective of this program is to determine the optimum number of trees per acre that should be left in a thinning operation to maintain stand growth.

References:

Authors: Bob Whilhite, 1975, Sierra College, Forestry Technology.

Specific Comments: Entering of variables in conversational mode. Has basic math fractions involved in acre plots.

****

Subject/Enterprise: Forestry/Harvesting/Cruising

Code: 353

Computer Level: Microcomputer
Computer Specific: Apple II
Language: Applesoft®
Required Core: 16K
Cross References:
Mode of Transfer: Hardcopy
Cost: Negotiable

Program Title: Timber Cruising

Program Description: Program allows mini forestry exams to be written and presented to the students. Student inputs diameter of base, number board feet/tree, acres of tree and based on average will calculate number board feet/acre.

References:

Authors: Paul Dilger, Agricultural Department, College of Desert, Desert Palm, CA.

Specific Comments: Internal program listing remarks necessary for operation.

Subject/Enterprise: Forestry/Forestry Management (General)

Computer Level: Microprocessor/mini-system
Language: HP BASIC (Easily modified to other forms)
Cross References:
Cost: Negotiable

Code: 310
Computer Specific: HP2000
Required Core: 16K
Mode of Transfer: Hard copy-program has 171 line codes in program

Program Title: ANDL50-Estimating Site Index from Plant Indicators

Program Description: This program will estimate a duncan dunning site index rating for the western sierra slopes using plant indicator species. This rating is a measure of timber productivity expressed as the number of feet a tree will grow in a hundred years. Prior to the use of this program, a vegetation survey must be completed to determine which of the plants are present. Variables: Timber type; elevation in feet; latitude in degrees; soil depth; ID of species present.

References:

Authors: Sierra College, Forestry Technology--Bob Whilhite; Ron Martinez.

Specific Comments: Question/answer/conversational format. Specific to a forestry timber production unit.

****

Subject/Enterprise: Forestry/Silviculture/Tree Planting

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Code: 322
Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: TREES BAS

Program Description: Program determines the number of trees which can be planted in an acre. Variable inputs: distance between rows, distance between trees. Output: total number of trees suitable for one acre.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Forestry/Surveys and Mapping

Code: 351
Computer Level: Microcomputer/minicomputer
Computer Specific: HP2000
Language: HP BASIC (easily adapted to other system languages)
Required Core: 8K
Mode of Transfer: Hard copy
Cross References:
Cost: Negotiable

Program Title: COORD--Calculation of Coordinates of Stations

Program Description: Calculates coordinates of stations in open or closed traverse. It will adjust closed traverses and calculate area by double meridian distance. This program has two modes. The tutorial mode will print the intermediate mathematical results used to obtain the Lat. and Dep. of the traverse. The production mode will print out only the Lat. and Dep. for the traverse and the area in square units. If distances are in chains, the area is in square chains. If distances are in feet, the area is in square feet.

References:

Authors: Sierra College, Forestry Technology--Bob Whilhite; Ron Martinez.

Specific Comments: Directions are excellent. Actual program descriptors absent.

****

Subject/Enterprise: Forestry/Mapping

Code: 351
Computer Level: Micro and minicomputers
Computer Specific: HP2000
Language: BASIC
Required Core: 8K
Cross References:
Mode of Transfer: Hard copy, 292 programmed steps
Cost: Negotiable

Program Title: TOPOG: Topographic Contour Elevation Determination

Program Description: This program is used to determine points of elevation change on a closed traverse. It will determine contour lines for any desired contour interval and compute the point that each contour occurs from each abney reading station and for the accumulated stations.

References:

Authors: Sierra College Forestry Technology--Bob Whilhite, program written by Jim Smith.

Specific Comments: Documentation has program description, example run and program commands. Does not have program descriptors.

Subject/Enterprise: Animal Science/Swine/Production Records and Analysis

Code: 440.42

Computer Level:
Language: TRS-80, BASIC, Level II
Cross References:
Cost: $10.00

Computer Specific: TRS-80
Required Core: 16K
Mode of Transfer: Cassette

Program Title: SOW. PIN

Program Description: Sow productivity index--gives 21 day adjusted wt/litter, sow production index and will compare sows in your herd. Input: weaning dates, ID, Iowa State gilt ratings, farrow dates, #/litter, wt. of litter.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: Documented; for large operation, will require additional RAM. Program occupies close to 16K RAM evidently.

****

Subject/Enterprise: Animal Science/General References

Code: 400

Computer Level: Microcomputer
Language: BASIC Level II, TRS-80
Cross References:
Cost: $20.00

Computer Specific: TRS-80, Model I
Required Core: 16K
Mode of Transfer: Disk or cassette

Program Title: Spellbound

Program Description: Program acquaints user with new words in a given subject area. Can be used in any subject area.

References:

Authors: Mr. Bob Baker, Computer Science Division, Marconi Tech Center, 3700 Marconi, Sacramento, CA, 916-484-2343.

Specific Comments: Advertised in the Radio Shack source book.

Subject/Enterprise: Animal Science/Dairy/Rations

Code: 410.52
Computer Level: Mainframe
Computer Specific: Burroughs
Language: Algol/Fortran IV
Required Core: 0
Cross References:
Mode of Transfer: N/A
Cost: $5/rations formulation, $2 ration analysis

Program Title: Evaluation

Program Description: Evaluation with feed input - by specifying sex, breed, background and the weight of the cattle being fed and some basic information about an existing ration, the program estimates the feed consumption level (per head/day) for the ration and the daily rate of gain (lbs). With this option the actual feed ingredients in the ration, their prices, and the percentage composition of the ingredients in the ration must be inputted. A nutrient analysis of the existing ration is calculated. Evaluation with energy input - The net energy for maintenance and net energy for gain values of an existing ration are required by this option of the program which estimates the level of consumption for the ration and the expected daily rate of gain. The cost of the ration per hundred pounds and the percent dry matter of the ration must also be specified. A profit projection is then developed based on this summary ration input.

References:

Authors: D. L. Bath, Extension Nutritionist, Animal Science, University of California, Davis, 916-752-1276.

Specific Comments: Time share, contact Dr. Bath for user code.

****

Subject/Enterprise: Animal Science/Livestock/Rations

Code: 400.52
Computer Level: Mainframe
Computer Specific: Burroughs
Language: Algol/Fortran IV
Required Core: 0
Cross References:
Mode of Transfer: N/A
Cost: $5 ration formulation; $2 ration analysis

Program Title: LC Ration

Program Description: The program is designed to formulate rations for beef, horses, rabbits, sheep and swine. The program formulates a ration from available feed ingredients based on a given set of fixed nutrient requirements. Input data include type of animal, feed prices, and nutrient constraints. Output includes % composition of the least cost ration, shadow prices on ingredients used in the ration, opportunity prices on feeds not used in the ration, ration cost, and estimated nutrient content of the ration. The program is run on remote terminal.

References:

Authors: D. L. Bath, Extension Nutritionists, Animal Science, University of California, Davis, 916-752-1276.

Specific Comments: Time share, contact D. L. Bath for usercode.

Subject/Enterprise: Animal Science/Dairy/Rations

Code: 410.52
Computer Level: Mainframe
Computer Specific: Burroughs
Language: Algol and Fortran IV
Required Core: Remote terminal
Cross References:
Cost: $5/ration, $2/current feed analysis
Mode of Transfer: Time share program, write Dr. Bath requesting user code

Program Title: Dairy

Program Description: Program formulates optimum ration from available feed ingredients to obtain maximum milk income above cost. Nutrient requirements based on the 1978 NRC bulletin on dairy. Input: cow weight, milk fat %, milk price, milk production response curve, % of 1st and 2nd lactation heifers, feed prices and ingredient constraints. Output: feed amounts, shadow prices on ingredients used in the nation, opportunity prices on ingredients, optimum milk production, and estimated nutrient analysis of the optimum ration.

References:

Authors: D. L. Bath, Extension Dairy Nutritionists, 149 Animal Science Building, University of California, Davis, 916-752-1276 or Judy King.

Specific Comments: This program can be run from a remote terminal via timeshare with requested user code. Q time can be slow during peak usage.

****

Subject/Enterprise: Animal Science/Dairy/Rations

Code: 410.52
Computer Level: Mainframe
Computer Specific: Burroughs
Language: Algol/Fortran IV
Required Core: 0
Cross References:
Cost: $5/ration formulation, $2 for ration analysis
Mode of Transfer: N/A

Program Title: Analysis

Program Description: The program calculates the nutrient content of a ration being fed in a dairy herd. Input data include cow weight, milk fat %, % of 1st and 2nd lactation heifers, and amounts of ration ingredients being fed. The output lists the nutrients provided by the ration, compares them with the nutrient requirements of the 1978 edition of the NRC bulletin, "Nutrient Requirements of Dairy Cattle," calculates the level of milk production that can be supported by the ration, and lists the limiting nutrient in the ration.

References:

Authors: D. L. Bath, Extension Dairy Nutritionists, Animal Science, University of California, Davis, 916-752-1276.

Specific Comments: The program is accessed by remote terminal.

Subject/Enterprise: Animal Science/Dairy/Rations

Code: 410.52

Computer Level: Mainframe
Language: Algol/Fortran IV
Cross References:
Cost: $5/rations formulation, $2 ration analysis

Computer Specific: Burrough/Remote terminal
Required Core: 0
Mode of Transfer: N/A

Program Title: LC Gain

Program Description: Program interactive with several alternative types of analysis for cattle feeding. Ration formulation - by specifying the type and weight of cattle and current feed prices, determines the ration which will minimize the total cost of gain for desired gain. May include overhead such as interest depreciation, rent, labor, and insurance. Profit projection - calculates daily projections of weight, costs, performance and profits. Outputs by day, week, monthly, etc. and close out summary. Recaps for ration (70 + lbs), nutrient analysis, and cost estimates are printed if number of feeding phases are more than one.

References:

Authors: D. L. Bath, Extension Dairy Nutritionist, Animal Science, University of California, Davis, 916-752-1276.

Specific Comments: Time share with Burroughs at UCD, contact Dr. Bath for user code and further information.

****

Subject/Enterprise: Animal Science/Dairy/Rations

Code: 410.52

Computer Level: Mainframe
Language: Algol/Fortran IV
Cross References:
Cost: Time share user fees - $5/ration

Computer Specific: Burroughs
Required Core: 0
Mode of Transfer: N/A

Program Title: LC Dairy

Program Description: Least Cost Dairy Rations formulates least cost ration from available feed for lactating and dry dairy cows based on NRC 1978 dairy requirements. Input: cow weight, level of production, milkfat %, % of 1st and 2nd lactation heifers, feed prices and ingredient constraints. Ouput: includes amounts of ingredients to feed, prices on ingredients used in the ration, opportunity prices on ingredients available but not used in rationing, feed cost, estimated nutrient analysis of the optimum ration.

References:

Authors: D. L. Bath, Extension Dairy Nutritionist, Animal Science Building, University of California Davis, 916-752-1276.

Specific Comments: Contact and secure user code; Q time slow during peak usage.

Subject/Enterprise: Animal Science/Beef Cattle/Management/Loss Prevention

Code: 420.14

Computer Level: Microcomputer

Computer Specific: TRS-80, I

Language: TRS-80, Level II, TRS DOS

Required Core: 48 K and 2 disk drives

Cross References:

Cost: Negotiable

Mode of Transfer: Diskette

Program Title: Death Loss Summary for Cattle

Program Description: Feedlot death loss recording and analyzing program. Provides yearly closeout totals, month death loss by lot #, date, diagnosis, management factor; summary by diagnosis by month, by year, by responsible party, by lot #, compares lot #, # head, wt., in date, origin, breed, closeout buyer tracking.

References:

Authors: Vet Extension, UCD, contact Dr. Ben Norman, DVM, Extension Vet, 916-752-0853

Specific Comments: Comes with worksheet, example and code sheet.

****

Subject/Enterprise: Animal Science/Dairy/Breeding Production

Code: 410.16

Computer Level: Microcomputer

Computer Specific: TRS-80, Model II, 2 disk drives

Language: BASIC, CP/M

Required Core: 64K, 2 disk drives

Cross References:

Cost: Negotiable

Mode of Transfer: Diskette

Program Title: Bovine Reproduction

Program Description: Management program for dairy reproduction operation. Input cow #, fresh date, bred date, examination reason, results. This provides data base summary for the dairy reproduction center, calving interval (months), calves to conception interval (days), first service conception rate (%), % returning for 3rd service, % cows pregnant, % cows in heat by 60 days, % cows bred by 90 days, % laboring, infertilty rate, culls, mean inter-estral interval, heat interval less than 18 days, 18-24 days, 25 to 37 days, 38-46 days, more than 46 days, plus comments by the veterinarian during visit.

References:

Authors: Ben Norman, DVM, Ph.D., Extension Veterinarian, UCD, 916-752-0853 (contact person)

Specific Comments: Comes with worksheet.

Subject/Enterprise: Animal Science/Beef/Production Records and Analysis

Code: 420.42

Computer Level: Micro or mini computer
Language: Level II BASIC, Radio Shack, DOS 3.3
Cross References:
Cost: $20.00

Computer Specific: TRS-80
Required Core: 16K
Mode of Transfer: Cassette or 8" soft sectored disk (DOS 3.3)

Program Title: BULL. TST

Program Description: Consists of five subprograms--maintains 20# (tatoo), breed, owner's name, birthdate, age in days, starting weight and ending weight. Program calculates average daily gain, adjusted 365 wt., 205 wt., lists herd, breed, tatoo. Serves as an inventory and a performance calculator for bull progeny.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo.

Specific Comments: Will handle up to 200 bulls, documentation available.

****

Subject/Enterprise: Animal Science/Swine/Product Analysis

Code: 440.42

Computer Level: Microcomputer
Language: 'C' BASIC/CP/U operation system
Cross References:
Cost: Negotiable

Computer Specific: TRS-80, Model II, with 2 disks
Required Core: 64K RAM, 2 disks
Mode of Transfer: 8" disk, CP/U DOS

Program Title: PIG

Program Description: Program is a management program for a hog production operation. Keeps track of breeding/gestation area (transfer in and out) (observed breedings); number born; nursery barn (deaths, cause, date) (movement); grower barn; farrowing barn. Output: inventory report--monthly for year, breeding lists, pregnancy checks, weaning list by sow, treatment costs by pig, medication by drug type.

References:

Authors: (McClosly-Kjerpe) Vet Med/UCD--Contact Dr. Ben Norman, DVM, Extension Veterinarian, University of California, Davis, 95616, 916-752-0853.

Specific Comments: Input worksheets available. Requires 64K RAM, 2 disk drives and CP/U operating system. Will run on any Z-80, 8080A CPU.

Subject/Enterprise: Animal Science/Dairy/Rations/Concentrates

Code: 410.52

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 16K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: CONC2. BAS

Program Description: Program calculates and outputs significant parameters at incremental concentrate feeding levels from zero concentrates to a user defined maximum level for milking dairy cows.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Chain from CONC. BAS necessary, input data supplied from CONC. BAS.

****

Subject/Enterprise: Animal Science/Dairy/Rations/Concentrates

Code: 410.52

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References: CONC2. BAS
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 16K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: CONC. BAS

Program Description: Program has 2 parts. Part A calculates and prints values of significant parameters at the optimum concentrate feeding level for milking dairy cows based upon user input data. Part B calculates and prints significant parameters at incremental concentrate feeding levels between zero concentrates and a user specified maximum level based on morrison's standards.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Chains to CONC2.

Subject/Enterprise: Animal Science/Livestock Improvement/Fairs and Shows

Code: 400.48

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: FAIRS. BAS

Program Description: Program lists data on 12 market animals taken to fairs. Data printed: animal name, type, weight, P.P.L.B., fair and year on each animal.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Program easily converted to user input to update data files.

****

Subject/Enterprise: Animal Science/Feeds/Protein % Determination

Code: 400.69

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: PROTEI. BAS

Program Description: Program calculates percent of crude protein in sample when percentage of nitrogen has been determined. Variable input: percent of nitrogen. Output: percent of crude protein. Loop is provided to change variable.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Animal Science/Sheep/Improvement Production Records

Code: 430.42

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: MLAMBS. BAS

Program Description: Program lists average weight gain of 10 market lambs. Program prints out birth, weaning and death weight and calculates the average gain.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Animal Science/Sheep/Breeds--Characteristics

Code: 430.32

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: ISHEEP. BAS

Program Description: Program gives information on all breeds of sheep. Information includes origin and brief description of animal. Loop is provided to retrieve information on different breeds.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Animal Science/Poultry/Breed Characteristics

Code: 450.32

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: CHICK1. BAS

Program Description: Program computes average weights of various chickens. Output: weight of male, weight of female, and average weight of 10 breeds of chickens. Data printed in table form.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Animal Science/Dairy/Feed Requirements

Code: 410.53

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: DAIRY. BAS

Program Description: Program determines daily nutrient requirements for dairy cattle. Variable inputs: type of dairy cattle, feed, weight and milk production. Output: nutrient schedule, daily feed requirements. Loop provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Animal Science/Swine/Breed Registry

Code: 440.34

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SOWLIN. BAS

Program Description: Program outputs bloodline data on 12 sows: birthdate, sire, dam's sire, and comments on dam. Data printed in table form.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Animal Science/Swine/Production Records

Code: 440.42

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SOWS. BAS

Program Description: Program outputs farrow information on 10 sows. Data, printed in table form, includes: times farrowed, number of pigs farrowed, number of pigs weaned. Program computes average number per litter.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Dairy/Feed Requirements

Computer Level: Microcomputer
Language: BASIC, Level II
Cross References:
Cost: $10.00

Code: 410.53
Computer Specific: Radio Shack TRS-80
Required Core: 16K
Mode of Transfer: Cassette tape or diskette

Program Title: Dairy Cow

Program Description: Calculates the daily feed requirements of the milk cow, depending on cow weight, milk production, fat content of the milk, supplement hay and silage and to evaluate a daily ration for nutritional adequacy and return over feed costs. Used to determine amount of feed required in the barn if hay amount, silage amount, and concentrate energy and digestible protein are known. Program will output onto printer. Matrix output--columns=feed/day, crude protein, digestible protein, net energy, Ca, phosphorus, daily requirements, requirements as % of ration, hay nutrition. Requirement after hay; silage nutrition, requirements after silage, concetr. reg.; lbs of concent. required, nutrition # insufficient.

References:

Authors: Ted Nelson, Oklahoma State University, Department of Agricultural Economics, Extension farm management.

Specific Comments: Serves as a nutritional test for larger mainframe ration mixers.

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Subject/Enterprise: Beef Cattle/Production & Analysis

Computer Level: Microcomputer
Language: BASIC, Level II
Cross References:
Cost: $10.00

Code: 420.42
Computer Specific: TRS-80
Required Core: 16K
Mode of Transfer: Cassette tape or disk (5 1/4")

Program Title: Beef Projection

Program Description: Program simulates feeding situation for beef cattle. User specifies feeder characteristics, financial data and ration content. Program estimates daily feed consumption, gain, feed conversion, net income per head, per hundred weight, and per day. Variables: sex, purchase weight, purchase price/cut, weight expected at sale, expected selling price/cut, gain grade (1 to 6), deads &, shrink %, commisions/hd, trucking/cut, vet costs, yardage costs, interest, equity ration data. Results are: # days on feed, wt., feed/day, gain/day, feed $/day, selling price/cut, profits/day.

References:

Authors: Ted Nelson, Extension Economist, Oklahoma State University, Department of Agricultural Economics, 513 Ag Hall, Stillwater, OK, 74074.

Specific Comments:

Subject/Enterprise: Beef Cattle/Feeding--Rations

Code: 420.52

Computer Level: Micro processor/mini processor
Language: TRS-80 BASIC (easily adapted to other BASIC forms), need hard copy
Cross References:
Cost: $10.00

Computer Specific: TRS-80 Radio Shack
Required Core: 16K
Mode of Transfer: Disc (5 1/4" diskette); cassette

Program Title: Beef Ration Evaluation

Program Description: This program enables the user to enter and modify proportions of several feed ingredients, observe the nutritional content of the composed ration and to compare those nutritional characteristics with the calculated nutritive requirements of an animal of specified age, sex and weight. The program contains stored data for six ingredients: airdry corn, high-moisture corn, silage, alfalfa hay, and a protein supplement. Variables: rate of gain, weight, age, sex, # lbs. of each ingredient fed/day. Output: Quantity of energy, protein, calcium, phosphorus, and cost. Total daily nutrients provided by ration. Total daily requirements to produce the requested grain per day deficiency of each nutrient.

References: "California" net energy coefficients; Great Plains Beef Nutrition Handbook.

Authors: Ted R. Nelson, Extension Economist, Department of Agricultural Economics, Oklahoma State University, 513 Ag Hall, Stillwater, OK, 74074, 405-624-6081.

Specific Comments: $5.00 of the cost is for the cassette or disc. By ordering more than one program on a given disc, a reduction in price of $5.00 off each of the other programs. This program is one of 11 BASIC programs offered by OSU. See appendix for complete listings of OSU programs.

****

Subject/Enterprise:

Code:

Computer Level:
Language:
Cross References:
Cost: $

Computer Specific:
Required Core:
Mode of Transfer:

Program Title:

Program Description:

References:

Authors:

Specific Comments:

Subject/Enterprise: Soils and Water Hydrology

Code: 552
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 8K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: WATER2. BAS

Program Description: This irrigation program calculates inches of water and depth water will wet. Variable inputs: types of soil of sand, loam, or clay; number of hours water is run; and the size of nozzle. Output: depth in inches water will wet. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: When loop is used to test different soil type, water variables must be reentered.

****

Subject/Enterprise: Soils/Irrigation/General

Code: 560
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: WATER. BAS

Program Description: This irrigation program calculates the amount of water used per acre. Variable inputs: number of gallons of water applied per minute; number of hours field is to be watered; and number of acres to be irrigated.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Program easily adapted to most microcomputers with BASIC language.

Subject/Enterprise: Soils/Sprinkler Irrigation

Code: 565
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: IRGA1. BAS

Program Description: This program calculates the sprinkler running time in hours. Variable inputs: inches per hour of water; rate (from 0 to 45). Output: running time in hours. Program includes loop to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Soils/Sprinkler Irrigation

Code: 565
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: SPRINK. BAS

Program Description: This program, based on the equation of area = pi r^2, calculates the coverage of a sprinkler traveling in a circular motion. The only variable is the distance of sprinkler's spray in feet. Program includes a loop to repeat calculation with varying distances of spray.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Easily adapted to most minicomputers with BASIC language.

Subject/Enterprise: Soils/Irrigation/General

Code: 560
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References: IRGA2, 4
Mode of Transfer: Hardcopy; nine-track, 800 BPI tape in ANSI or DEC DOS format
Cost: Negotiable

Program Title: IRGA3. BAS

Program Description: Program calculates hours required for irrigation. Input variables: soil type, root zone depth, and soil infiltration. Output: total time of irrigation required in hours. Loop provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Soils/Irrigation/General

Code: 560
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References: IRGA3, 4
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: IRGA2. BAS

Program Description: This program calculates GPM/acre needed for root crops. Variable inputs: soil texture, evapotransportation rate, root zone of crop, rainfall, growing rate in days, and number of acres. Calculations give gallons per acre needed and total gallons needed. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Soils/Irrigation/Lawns

Code: 560
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: LAWN. BAS

Program Description: Program computes amount of water applied to a lawn. Variable inputs: gallons of water per minute being applied; minutes lawn is to be watered; width and length of lawn. Output: amount of water in acre inches per foot. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Soils/Irrigation/General

Code: 560
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: IRGA4. BAS

Program Description: This program will calculate a useable water and irrigation schedule. Variable inputs: soil texture; evapotransportation rate; root zone; and consumptive use of plant daily calculations give data on available water, useable water, daily consumptive use, an irrigation schedule and the length of time of irrigation. Loop is provided to change the aforementioned variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Soils/Irrigation

Code: 560
Computer Specific: Burroughs 6700
Required Core:
Mode of Transfer: Batch transfer of data and output

Computer Level: Mainframe
Language: Fortran IV
Cross References:
Cost:

Program Title: Irrigation Cost Program

Program Description: Irrigation Cost is a computer program which calculates fixed and variable costs per acre-inch and per acre under various assumptions regarding the irrigation well, fuel source, distribution system, and water requirements. The user may specify numerous variables in a manner that will allow many, if not most, irrigation situations to be simulated.

References:

Authors: Gerald L. Horner, University of California, Davis, 916-752-6001.

Specific Comments: Batch transfer, need user code.

****

Subject/Enterprise:

Code:
Computer Specific:
Required Core:
Mode of Transfer:

Computer Level:
Language:
Cross References:
Cost: $

Program Title:

Program Description:

References:

Authors:

Specific Comments:

Subject/Enterprise: Forestry/Forest Tree Diseases

Code: 637

Computer Level: Micro and mini computer
Computer Specific: HP 2000
Language: HP BASIC
Required Core: 8K
Cross References:
Mode of Transfer: Hardcopy; 48 programmed steps plus data files
Cost: Negotiable

Program Title: DISEZ

Program Description: Identification of scientific names for common tree diseases. Straight forward identification program. Program asks student the scientific name of a fungus and checks the students answer against file. Program structured so that additional disease pairs can be added easily.

References:

Authors: Sierra College, Rocklin, Bob Whilhite, Forestry Technology.

Specific Comments: Program is formatted so that any data pairs might be placed in the program. Therefore this is a simple program that could be used to identify scientific names of plants, etc. Again, program hard copy documentation does not have descriptors.

****

Subject/Enterprise: Insects, Diseases, Pests/Field Crop Insects

Code: 622

Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: PESTS. BAS

Program Description: Program outputs information on control of harmful insects in alfalfa. User identifies insect and is directed to data in program regarding control of pest. Loop is provided to retrieve data on any one of 10 pests.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Convenient inventory update would require reprogramming data input mode.

Subject/Enterprise: Agricultural Engineering/Trucks

Code: 765
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: MAINT. BAS

Program Description: Program records motor hours of fleet of trucks and related equipment. Output: table of vehicle and number; motor hours; fuel used. Program computes fuel use/hour and places vehicle most needing maintenance at top of list.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Agricultural Engineering/Supply Inventories

Code: 782
Computer Level: Minicomputer
Computer Specific: PDP 1170
Language: DEC BASIC PLUS
Required Core: 4K
Cross References:
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format
Cost: Negotiable

Program Title: NUTS. BAS

Program Description: Program inventories stock of 1 inch hex nuts and bolts of various sizes from 3/16 to 1 inch. Data outputs size, number in stock, and stock number in table form.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments: Inventory limited only by storage capacity.

Subject/Enterprise: Agricultural Engineering/Electric Power--Motors

Code: 773

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost: Negotiable

Computer Specific: Apple II
Required Core: 4K
Mode of Transfer: Hardcopy print--15 command lines

Program Title: Horsepower Calculations

Program Description: Program calculates horsepower after user enters torque and RPM value.

References:

Authors: Paul Dilger, Agricultural Department, College of Desert, Palm Desert, CA.

Specific Comments: Program will run on any BASIC CPU with one program change.

****

Subject/Enterprise: Agricultural Engineering/Farm Power/Field Efficiency

Code: 769

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: TRACTO. BAS

Program Description: Program calculates field capacity of a tractor in acres per hour. Variable inputs: tractor speed in mph, width of implement in feet, and field efficiency in percent. Output: field capacity in acres per hour--printed out in array with above variables. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Agricultural Engineering/References/Supplies

Code: 701

Computer Level: Microcomputer

Computer Specific: Apple II

Language: Applesoft®

Cross References:

Cost: Negotiable

Required Core: 16K, additional for expanded inventory

Mode of Transfer: Diskette

Program Title: Machine Parts Inventory

Program Description: Inventory of parts by name, volume, comments and record number. Menu selection of type of data base, search or change data, enter, delete, repeat or sort data. Print or no print, list, exit.

References:

Authors: Paul Dilger, Agricultural Education, College of Desert, Desert Palm, CA.

Specific Comments: Program will hold 520 records.

****

Subject/Enterprise:

Code:

Computer Level:

Computer Specific:

Language:

Required Core:

Cross References:

Mode of Transfer:

Cost: $

Program Title:

Program Description:

References:

Authors:

Specific Comments:

Subject/Enterprise: Agricultural Economics/General References

Code: 801

Computer Level: Micro or mini computers
Language: BASIC
Cross References:
Cost: $10.00

Computer Specific: TRS-80, Radio Shack
Required Core: 10K
Mode of Transfer: Tape or disk

Program Title: Record Sort (AECO 4.204.14 Sort)

Program Description: The SORT program is a general purpose routine for storing, changing, expanding, sorting and printing alpha-numeric records. Typical uses would be for mailing and telephone lists, livestock, field crops or machine part records, etc. The first record entered and stored for each file (set of lines) is a heading provided by the user to define the location of each subfield in the record, so the program can be used for several different data sets.

References:

Authors: Department of Agricultural Economics, Extension Farm Management, Oklahoma State University.

Specific Comments: This program is available for either disk or tape storage.

****

Subject/Enterprise: Agricultural Economics/Farm Finance

Code: 831

Computer Level: Micro or mini computer
Language: BASIC
Cross References:
Cost: $10.00

Computer Specific: TRS-80 Radio Shack
Required Core: 16K
Mode of Transfer: Tape or disk

Program Title: Loan Calculator

Program Description: This program answers several questions about lending or borrowing situations: 1) What size loan can be supported given interest rate, number of payments/yr, number of years, and payment size? 2) Rate of interest (effective) being paid. 3) How many years to repay a loan? 4) What is the payment size? Results include amount of original loan, effective interest rate, total interest to be paid, number of payments required, size of payment, the amount of the final payment and the number of years to pay. In addition it supplies the amount of each payment that applies to interest or principal and the unpaid balance.

References:

Authors: Ted Nelson, Extension Economists, Department of Agricultural Economics, Oklahoma State University, Stillwater, OK, 74074.

Specific Comments:

Subject/Enterprise: Agricultural Economics/Farm Management/Planning

Code: 811

Computer Level: Mainframe
Language: IBM PL/I
Cross References:
Cost:

Computer Specific: Burroughs 6700
Required Core:
Mode of Transfer: N/A

Program Title: LP FARM

Program Description: LP FARM is a computerized forward planning program developed at OSU. It is a tool to determine the most profitable enterprise organization. Information on the farm's resources, crop budgets and livestock budgets are input. Crop and livestock budget information can be obtained from the Extension Budget Generator or figures can be included via the input form. Information on the farm resources--acres, soil types, rental, labor available, government programs and forced maximum or minimum production (where desired)--are coded on the input form as well. LP FARM then calculates the "best" enterprise organization with the given data and prints out: the resources and restrictions the user supplies, a summary of the optimum farm plan, a detailed breakdown of the optimum plan, and a comparison when multiple solutions are requested.

References:

Authors: Jim Cothern, Extension Agricultural Economics, University of California, Davis, 916-752-6705.

Specific Comments: Batch transfer of input/output.

****

Subject/Enterprise: Agricultural Economics/Farm Management/Accounting

Code: 818

Computer Level: Microcomputer
Language: TRS-80 BASIC
Cross References:
Cost: $20.00

Computer Specific: TRS-80
Required Core: 16K
Mode of Transfer: Disk or cassette

Program Title: T. ACCT

Program Description: Business problem exercise that presents various transactions and requires user to post the items in correct accounting sheets. Comes in source language.

References:

Authors: Bob Baker, Computer Science Division, Marconi Tech Center, 3700 Marconi, Sacramento, CA, 95821, 916-484-2343.

Specific Comments: Source language, documentation supplied.

Subject/Enterprise: Agricultural Economics/Agricultural Business/Farm Finance

Code: 831

Computer Level: Microcomputer

Computer Specific: Apple II

Language: Applesoft®

Cross References:

Required Core: 4K

Cost: Negotiable

Mode of Transfer: Hardcopy

Program Title: Simple Interest Loan

Program Description: Program calculates payment per month, itemized balance and interest projection, total interest, total cost based upon three inputs: amount of loan, percent interest and months of loan repayment.

References:

Authors: Paul Dilger, Agricultural Education, College of Desert, Desert Palm, CA.

Specific Comments: Simple operation due to excellent input statements.

****

Subject/Enterprise: Agricultural Economics/Production Economics/General

Code: 820

Computer Level: Mainframe

Computer Specific: Burroughs 6700

Language: Fortran IV

Cross References:

Required Core: 220K

Cost:

Mode of Transfer: N/A

Program Title: Budget Generator

Program Description: This program is a modified version of the OSU Budget Generator. The program has default information stored for machinery, buildings, fuel, wages, interest, and other parameters. Also stored is budget information regarding production, operating inputs, custom operations, machinery usage and land. These factors are then used to "generate" a cost-return study for a particular enterprise. Output includes a summary of costs and returns, a cash flow of expenses, a detailed breakdown on labor, irrigation, and machinery use and expenses.

References:

Authors: Jim Cothern, Extensionist, University of California, Davis, 916-752-6705.

Specific Comments: Remote terminal and batch delivery mode for time sharing.

Subject/Enterprise: Agricultural Economics/Farm Management/Farm Accounting

Code: 818

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost:

Computer Specific: Apple II
Required Core: 16K, disk
Mode of Transfer: Disk 5 1/4"

Program Title: General Ledger

Program Description: Menu selection of subprograms: Sales and cash receipts, payments and expenses, receipts file search, business header, sales and cash summary, general summary statement, expenses file search, receipts index # search, expenses index # search.

References:

Authors: Paul Dilger, College of Desert, Agricultural Education, Palm Desert, CA.

Specific Comments: Program statement printout good.

****

Subject/Enterprise: Agricultural Economics/Agricultural Bsuiness, Taxation

Code: 837

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost: Negotiable

Computer Specific: Apple II
Required Core: 16K
Mode of Transfer: Hard copy; disk

Program Title: Federal Tax Program

Program Description: This program allows you to compute taxes, make corrections and list figures for transfer to IRS 1040. User defines: filing status, # exemptions, wages, interest income, dividends, business, adjustment to income, itemization, etc.

References:

Authors: Unknown, contact Paul Dilger, College of Desert, Desert Palm, CA.

Specific Comments: Program listing is source code therefore updating IRS variables easily accomplished.

Subject/Enterprise: Agricultural Economics/Agribusiness/Taxation

Code: 837

Computer Level: Microcomputer
Computer Specific: TRS-80
Language: Radio Shack TRS-80, Level II
Required Core: 16K
Cross References:
Mode of Transfer: Cassette
Cost: $10.00

Program Title: FARM. DEP

Program Description: Program calculates farm depreciation and investment credit calculations. Menu choice of type of depreciation; and/or 20% additional 1st year depreciation; and/or investment tax credit. Input cost of inventory, life of item, type of depreciation. Printed output.

References:

Authors: Bill Michaud, Agricultural Economics, Cal Poly, San Luis Obispo

Specific Comments: Program also calculates depreciation for partial years. Documentation available.

****

Subject/Enterprise: Agricultural Economics/Production Economics/Analysis

Code: 821

Computer Level: Microcomputer
Computer Specific: TRS-80
Language: TRS-80, BASIC, Level II
Required Core: 16K
Cross References: FED. PIG (821)
Mode of Transfer: Cassette
Cost: $10.00

Program Title: STR. FED

Program Description: Program calculates breakeven sell price on beef operation; calculates profit, return on investment, and purchase price for an expected return. Variables update by menu selection.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: Documented.

Subject/Enterprise: Agricultural Economics/Production Economics/Analysis
Code: 821

Computer Level: Microcomputer
Computer Specific: TRS-80
Language: TRS-80, Level II BASIC
Required Core: 16K
Cross References: FED. PIG (821)
Mode of Transfer: Cassette
Cost: $10.00

Program Title: FED. LMB

Program Description: Program calculates the breakeven selling price on lamb operations; calculates profit, return on investment, and purchase price for an expected return. Output/day/month selectable. Variable updates by menu selection.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: See similar program for beef and swine.

****

Subject/Enterprise: Agricultural Economics/Production Economics/Cost Analysis
Code: 821

Computer Level: Micro and mini computer
Computer Specific: TRS-80
Language: TRS-80, Level II BASIC
Required Core: 16K
Cross References: FED. LMB (821); STR. FED (821)
Mode of Transfer: Cassette
Cost: $10.00

Program Title: FED. PIG

Program Description: Program calculates the breakeven selling price on feeder pig operation; calculates profit, return on investment, and purchase price for an expected return. Output per day, per month. Variables can be updated by menu selection.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: See similar program in beef and sheep.

Subject/Enterprise: Agricultural Economics/Livestock Enterprise Management

Code: 816

Computer Level: Microcomputer
Language: BASIC, Level II
Cross References:
Cost: $30.00

Computer Specific: TRS-80, Radio Shack
Required Core: 32K handles 17 pens; 48K up to 120 pens
Mode of Transfer: Disk

Program Title: Feedlot

Program Description: A pen record program which tracks each pen of cattle on costs accumulated while on feed. Prints status report on any pen at any time and closes out when all costs and income have been entered. Billing subroutine prints biweekly summary of rations fed and miscellaneous costs for each pen. Printout for single pen would provide: present wt average and total pen, purchase wts, gain, pounds feed fed, cattle cost, vet-med, feedcost, interest, yardage, cost of gain, total cost, estimated value, net return, annual % rate of return on investment. Program provides overall feedlot summary by sex and type and owner of pen.

References:

Authors: Ted Nelson and Jane Palmer, Extension Farm Management, Oklahoma State University, Stillwater, OK, 74074.

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Farm Business Analysis

Code: 818

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: EQUITY BAS

Program Description: Program computes dollar values of total business assets. Variable inputs: cash, livestock, machinery and land, and liabilities. Output: equity in dollar value in given year. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Agricultural Economics/Farm Accounting Records

Code: 818

Computer Level: Microcomputer
Language: BASIC
Cross References:
Cost: $30.00

Computer Specific: TRS-80
Required Core: 16K RAM and 48K tape storage
Mode of Transfer: Tape

Program Title: Micro Farm Record Program (tape only) (AECO 4.204.15A)

Program Description: Basic functions are to provide for entry of cash transactions and to store and summarize cash flows. Then provide for computation and the printng of the net worth statement. Secondary functions include summarization of accounts payable and receivables, enterprise costs and receipts, crops, livestock data, etc. Handles 52 income and 47 expense categories; 99 inventory categories for net worth computation, 9 to 49 employee payrolls, 9 to 99 external accounts payable and receivables, five bank accounts, and five enterprises.

References:

Authors: Ted Nelson, Extension Economist; Jane Palmer, Assistant Programmer, Department of Agricultural Economics, Extension Farm Management, Oklahoma State University, Stillwater, OK, 74074.

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Farm Accounting Records

Code: 818

Computer Level: Microcomputer
Language: BASIC
Cross References:
Cost: $30.00

Computer Specific: TRS-80
Required Core: 32K RAM, 48K tape or disk storage
Mode of Transfer: Diskette or tape

Program Title Micro Farm Record Program, 32K & 48K (AECO 4.204.15)

Program Description: Functions as a record system that provides for entry of cash transactions, storage and summary of cash flows and provides for computation and printing of net worth statements. Secondary functions include summary of accounts payable and receivables, enterprise costs and receipts, crops and livestock data.

References:

Authors: Ted Nelson, Extension Economist; Jane Palmer, Assistant Programmer, Department of Agricultural Economics, Extension Farm Management, Oklahoma State University, Stillwater, OK, 74074.

Specific Comments: Must be familiar with DOS system for file storage.

Subject/Enterprise: Agricultural Economics/Production Economics/Analysis

Code: 821

Computer Level: Microcomputer
Computer Specific: TRS-80
Language: BASIC, TRS-80, Level II
Required Core: 16K
Cross References:
Mode of Transfer: Cassette
Cost: $10.00

Program Title: SHP. BRD

Program Description: Program calculates return on investments, profits, breakeven sell price, sell price vs. profit level and outputs a profit/loss financial statement based on input variables--% interest rate, labor cost, marketing cost, stock costs, breeding costs, replacement rate, lamb crop (number and weight); culls (# and wt), $/lb, weight and number of lambs for culls.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: Variables may be altered to apply to other breeds with minor program modification.

****

Subject/Enterprise: Agricultural Economics/Survey

Code: 890

Computer Level: Microprocessor
Computer Specific: TRS-80
Language: TRS-80, BASIC Level II
Required Core: 16K RAM
Cross References: Survey methods for agriculture are listed under open section of Ag Econ. See Ag Dex listing codes
Mode of Transfer: Cassette
Cost: $10.00

Program Title: VAR. RND

Program Description: Random sample generator--will sample up to 100 random names. Enter population size of survey, sample sized desired. Can segment sample group, 2 levels.

References:

Authors: Bill Michaud, Agricultural Education, Cal Poly, San Luis Obispo

Specific Comments: Output--printer or screen.

Subject/Enterprise: Agricultural Economics

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Code: 825
Computer Specific: PDP 170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: PMPEFF. BAS

Program Description: Program calculates pumping plant efficiency. Variable inputs: power source; cost from bill; hours of pump operation; and lift of system. Output: cost per hour; brake horsepower; water horsepower required; pump efficiency, and cost of acre feet for water. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Farm Accounting/Payroll

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost:

Code: 818
Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SALARY. BAS

Program Description: Program computes weekly salary if paid an hourly wage. Variable inputs: hours worked, rate of pay per hour, percentage of state and federal tax used. Output: gross salary, taxes withheld, and net income for week. Loop is provided to change variables.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Agricultural Economics/Production Crops

Code: 821
Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Program Title: GRAPE1. BAS

Program Description: Program calculates dollars required for one acre of grapes per month for period of one year. Program gives dollar values for fertilizer, sulfur, tractor and labor and totals values for each month. Data is printed out in table form for entire year.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Land Use

Code: 815
Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Program Title: ACRES. BAS

Program Description: Program computes the number of acres in rectangular fields. Variable inputs: length of field in feet; width of field in feet. Output: total number of acres.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Agricultural Economics/Statistics/Price Reports

Code: 855

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: STEER. BAS

Program Description: Program lists average monthly price of 500-575 lb. steer calves for 1976-1979. In column form, data printout gives price per pound in cents for each month with sections for each year.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Production Economics/Profits

Code: 820

Computer Level: Minicomputer
Language: DEC BASIC PLUS
Cross References:
Cost: Negotiable

Computer Specific: PDP 1170
Required Core: 4K
Mode of Transfer: Hardcopy; nine-track, 800 BPI tapes in ANSI or DEC DOS format

Program Title: SHEEP. BAS

Program Description: Program computes increase or decrease in dollars on 10 head of Suffolk sheep. Dollar values are given for receipts and expenses on each head and program calculates receipts minus expenses. Data printed in table form.

References:

Authors: Bakersfield College, Keith Haycock

Specific Comments:

Subject/Enterprise: Agricultural Economics/Production Economics

Code: 820

Computer Level: Microcomputer

Computer Specific: TRS-80

Language: BASIC

Required Core: 16K

Cross References:

Mode of Transfer: cassette, tape or disk

Program Title: Graph Illustration

Program Description: Graph produces a graph on screen for commodity prices from user-specified high, low, and maximum daily move with random selection of daily moves within specified range: or a graph from input series of prices for 100 observations (days, weeks, months, etc.). Primarily the graph program is intended as a skeleton program to be modified to present two dimensional graphic information on the screen of the microcomputer. It also illustrates the use of the random number generators included in most microcomputer built-in subroutines.

References:

Authors: Ted Nelson, Extension Economist, Department of Agricultural Economics, Oklahoma State University, Stillwater, OK 74074.

Specific Comments:

****

Subject/Enterprise: Agricultural Economics/Production Economics

Code: 820

Computer Level: Microcomputer

Computer Specific: TRS-80, Level II

Language: BASIC, Level II

Required Core: 16K, program uses about 10k of memory

Cross References:

Mode of Transfer: Tape or disk

Cost: $10.00

Program Title: Micro-Computer Government Program Comparison

Program Description: Program calculates net revenue and breakeven prices for nonparticipating vs. participating acreage crops in 1980 wheat-feedgrain-cotton program under various input assumptions about yields, production costs, and market prices. Variables: Production acres, expected sales, deferred payments, disaster payments, net returns, crop operating costs, set aside operating costs, loan rate, target prices. Outputs: net revenue, break even prices.

References:

Authors: Ted Nelson, Extension Economist; Jane Palmer Extension Assistant, Department of Agricultural Economics, Oklahoma State University, Stillwater, OK, 74074.

Specific Comments: User documentation weak. Abbreviated labels difficult to decipher. Equations for calculating results not given.

Subject/Enterprise: Agricultural Economics/Machinery and Equipment Economics

Code: 825

Computer Level: Micro or mini computer
Computer Specific: TRS-80
Language: BASIC TRS-80
Required Core: 16K
Cross References:
Mode of Transfer: or disc
Cost: $10.00

Program Title: Machinery Cost (AECO 4.204.12)

Program Description: The program computes ownership, repair, and fuel costs of machinery using the computational procedures. Repair and depreciation "constants" may be changed quickly and conveniently when desired. Program allows machines to be coded and categorized. Changing constants and data have separate routine. Question/answer format.

References:

Authors: Ted Nelson, Extension Economist; Jane Palmer, Extension Assistant, Department of Agricultural Economics

Specific Comments: User documentation good.

****

Subject/Enterprise: Agricultural Economics/Storage Costs and Economics

Code: 827

Computer Level: Microcomputer
Computer Specific: TRS-80
Language: BASIC TRS-80
Required Core: 16K
Cross References:
Mode of Transfer: Tape or disc
Cost: $10.00

Program Title: Grain Storage (AECO 4.204.08 Grainstr.)

Program Description: Grain storage program compares various storage situations and calculates storage costs and breakeven prices. Input variables: Harvest price, interest rate, months of storage (6), type of storage, storage cost (cost of bin, life, capacity, interest rate), hauling, moisture in, moisture out, shrink output. Comparison of 3, 6, 9, 12, 24, 36 months for hauling, shrink, insurance, interest, storage, breakeven.

References:

Authors: Ted Nelson, Extension Economist; Jane Palmer, Extension Assistant, Department of Agricultural Economics, Oklahoma State University, Stillwater, OK, 74074

Specific Comments: Very good user operating instructions. Good simulation program.

Subject/Enterprise: Agricultural Economics/General

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost: Negotiable

Code: 890
Computer Specific: Apple II
Required Core: 4K - depends upon list size
Mode of Transfer: Hard copy - 41 command lines

Program Title: Alphabetization

Program Description: Sorts alpha names. Program must be changed to input data.

References:

Authors: Paul Dilger, Agriculture Department, College of Desert, Palm Desert, CA.

Specific Comments: Input statement would allow you to input in DIM array and sort for alpha order. Single disc required.

****

Subject/Enterprise: Agricultural Economics/Basic Math

Computer Level: Microcomputer
Language: Applesoft®
Cross References:
Cost: Negotiable

Code: 890
Computer Specific: Apple II
Required Core: 4K
Mode of Transfer: Hardcopy print, 66 command lines

Program Title: Graph

Program Description: Graph an equation. Set up to graph, in color, on an Apple II system (6502)--menu select an equation--graphic simulation output. Options are Y=X, $Y=X^2$, y=sin (x) y=tan (x), y=log (x), $y=(R^2-x^2)^{.5}$. Program contains range of x inputs values.

References:

Authors: Paul Dilger, Agricultural Department, College of Desert, Palm Desert, CA.

Specific Comments: Input statements would allow x values to be inserted for each equation with minor programming changes.

APPENDIX A

California Computer Club Directory

THE APPLE CORE
P. O. Box 4816
Main Post Office
San Francisco, CA 94101

ASSOCIATION FOR EDUCATIONAL DATA, Dept. of Education
6401 Linda Vista Road
San Diego, CA 92111

BAY AREA MICROPROCESSOR USERS GROUP (BAMUG)
1211 Santa Clara Avenue
Alameda, CA 94501

BAY AREA MICRO GROUP
4565 Black Avenue
Pleasanton, CA 94566

BEVERLY HILLS HS COMPUTER CLUB
241 San Marino Drive
Beverly Hills, CA 90212

CALCULATOR LIB: THE LIBERATED CALCULATOR USERS CLUB
P. O. Box 2151
Oxnard, CA 93034

CALIFORNIA COMPUTER SOCIETY
P. O. Box 9459
North Hollywood, CA 91609

COMPUTER ORGANIZATION OF LOS ANGELES
P. O. Box 43677
Los Angeles, CA 90043

COMPUTER GUILD
P. O. Box 255232
Sacramento, CA 95825

COMPUTER INFORMATION ORGANIZATION, INC.
P. O. Box 158
San Luis Rey, CA 92068

COMPUCOLOR-INTERCOLOR USERS GROUP
5250 Van Nuys Blvd.
Van Nuys, CA 91401

COMPUTER PHREAQUES UNITED
2090 Cross Street
Seaside, CA 93955

DIABLO PROFESSIONAL USERS GROUP
321 Golf Club Road
Pleasant Hill, CA 94523

GLENDALE COLLEGE COMPUTER CLUB
1500 N. Verdergo Road
Glendale, CA 91208

HOMEBREW COMPUTER CLUB
P. O. Box 626
Mountview, CA 94042

INLAND COMPUTER SOCIETY
P. O. Box 55052
Riverside, CA 92517

JIM McCORD
330 Vereda Legenda
Goleta, CA 93017

LITTON CALCULATOR/COMPUTER CLUB
Litton Guidance and Control Systems, Ms 78/31
5500 Canoga Avenue
Woodland Hills, CA 91364

LLLRA HOBBYIST GROUP
35 West Essen Street
Stockton, CA 95204

LO*OP CENTER
8099 La Plaza
Cotati, CA 94928

NORTH ORANGE COUNTY COMPUTER CLUB
P. O. Box 3603
Orange, CA 92665

29 PALMS AREA GROUP
Box 3558 C & E Schools M.C.B.
29 Palms, CA 92278
or
13-C Cooper Drive M.C.B.
29 Palms, CA 92278

PPC
2541 W. Camden Place
Santa Ana, CA 92704

POMONA GROUP
4155 Oak Hollow Road
Claremont, CA 91711

PROTEUS
1690 Woodside Road, #219
Redwood City, CA 94061

ROBOT BUILDER
208 Via Colorin
Palos Verdes Estates, CA 90274

SACRAMENTO MINICOMPUTER USERS GROUP
Box 741
Citrus Heights, CA 95610

SACRAMENTO MICROCOMPUTERS USERS GROUP
P. O. Box 161513
Sacramento, CA 95816

SAN GABRIEL SCCS
400 S. Catalina Avenue
Pasadena, CA 91106

SAN LUIS OBISPO MICRO-COMPUTER CLUB
439B Marsh Street
San Luis Obispo, CA 93401

SANTA BARBARA COMPUTER GROUP
210 Barrunca, Apt. 2
Santa Barbara, CA 93101

SANTA BARBARA NAMELESS COMPUTER CLUB
1445 La Clima Road
Santa Barbara, CA 93101

SOLUS, THE SOL USERS SOCIETY
P. O. Box 23471
San Jose, CA 95153

6800 COMPUTER CLUB
P. O. Box 18081
San Jose, CA 95158

SOUTHERN CALIFORNIA COMPUTER SOCIETY
P. O. Box 987
South Pasadena, CA 91030

SOUTHERN CALIFORNIA COMPUTER SOCIETY
Box 54751
Los Angeles, CA 90054

UCLA COMPUTER CLUB
3514 Boelter Hall
UCLA
Los Angeles, CA 90024

VALLEY CHAPTER, SCCS
5652 Lemona Avenue
Van Nuys, CA 91411

VENTURA COUNTY COMPUTER SOCIETY
P. O. Box 525
Port Hueneme, CA 93041

APPENDIX B

LIST OF PERSONAL COMPUTER MANUFACTURERS

APPLE COMPUTER, INC.
10260 Bandley Drive
Cupertino, CA 95014
(408) 996-1010

ATARI CONSUMER DIVISION
1265 Borregas Avenue
P. O. Box 427
Sunnyvale, CA 94086
(800) 672-1404 (CA)
(800) 538-8547

BELL & HOWELL COMPANY
7100 McCormick Road
Chicago, Illinois 60645
(312) OR 3-3300

CALIFORNIA INDUSTRIAL
15214 Grevill Avenue
Lawndale, CA 90260
(213) 772-0800

CANADA SYSTEMS, INC.
1353 Foothill Blvd.
La Canada, CA 91011
(213) 790-7957

CENTRAL DATA CO.
P. O. Box 2484, Station A
Champaign, IL 61820
(217) 359-8010

COMMODORE BUSINESS MACHINES, INC.
901 California Avenue
Palo Alto, CA 94304
(415) 326-4000

COMPAL (Computer Power and Light)
12321 Ventura Blvd.
Studio City, CA 91604
(213) 760-3345

COMPUCOLOR CORPORATION
5965 Peachtree Corners East
Norcross, GA 30071
(404) 449-5961

COMPUTALKER CONSULTANTS
P. O. Box 1951
Santa Monica, CA 90406
(213) 392-5230

THE COMPUTER FAIRE
Box 1579
Palo Alto, CA 94302
(415) 851-7075

COMPUTER SHOP
288 Norfolk Street
Cambridge, MA
(617) 473-2323

THE COMPUTERIST
P. O. Box 3
S. Chelmsford, MA 01824
(617) 256-3649

CROMEMCO CORPORATION
280 Bernardo Avenue
Mountain View, CA 94043
(415) 964-7400

DATA GENERAL CORPORATION
Route 9
Westboro, MA 01772
(617) 366-8900

DIGITAL EQUIPMENT CORP.
146 Main Street
Maynard, MA 01754
(617) 897-5111

E & L INSTRUMENTS
61 First Street
Derby, CT 06418
(203) 735-8774

ELECTRONIC CONTROL TECHNOLOGY
763 Ramsey Avenue
Hillside, NJ 07205
(P. O. Box 6, Union, NJ 07083)
(201) 686-8080

ELECTRONIC SYSTEMS
P. O. Box 212
Burlingame, CA 94010
(408) 374-5984

FRANKLIN ELECTRIC
733 Lakefield Rd.
Westlake Village, CA 91361
(805) 497-7755

GENERAL MICRO-SYSTEMS
12369 W. Alabama Place
Lakewood, CO 80228
(303) 985-3423

BILL GODBOUT ELECTRONICS
Box 2355
Oakland Airport, CA 94614

THE HEATH COMPANY
Benton Harbor, MI 49022
(616) 982-3417

IMSAI MFG. CORPORATION
14860 Wicks Blvd.
San Leandro, CA
(415) 483-2093

INFINITE INC.
1924 Waverly Place
Melbourne, FL 32901
(305) 724-1588

INTELLIGENT SYSTEMS CORP.
225 Technology Park/Atlanta
Norcross, Georgia 30092
(404) 449-5961

I O R
P. O. Box 28823
Dallas, TX 75228
(214) 358-2671

ITHACA AUDIO
P. O. Box 91
Ithaca, NY 14850
(607) 273-3271

JADE COMPUTER PRODUCTS
5351 West 144th
Lawndale, CA 90260
(213) 679-3313

LEXINGTON BOOKS
D. C. Heath & Co.
125 Spring Street
Lexington, MA 02173
(617) 862-6650

LOGICAL SERVICES INC.
1080-H East Duane Ave.
Sunnyvale, CA 94086
(408) 245-8855

MARINCHIP SYSTEMS
16 St. Jude Road
Mill Valley, CA 94941
(415) 383-1545

MICRONICS, INC.
P. O. Box 12545
Raleigh, NC 27605

MIDWEST SCIENTIFIC INSTRUMENTS, INC.
220 W. Cedar Street
Olathe, KS 66061
(913) 764-3273

MOUNTAIN HARDWARE, INC.
P. O. Box 1133
Ben Lomond, CA 95005
(408) 336-2495

NBL
Box 1564
Richardson, TX 75080
(214) 231-2703

NETRONICS R & D LTD.
333 Litchfield Road
New Milford, CT 06776
(203) 354-9375

NORTH STAR COMPUTERS, INC.
1440 4th Street
Berkeley, CA 94710
(415) 527-6950

NOVAL, INC.
8401 Aero Drive
San Diego, CA 92123
(714) 277-8700
OAE (Oliver Advanced Engineering)
676 West Wilson Avenue
Glendale, CA 91203
(213) 240-0080

OHIO SCIENTIFIC
Box 36
Hiram, OH 44234
(216) 562-3101

OSBORNE & ASSOC.
P. O. Box 2036
Berkeley, CA 94702
(415) 548-2805

PARASITIC ENGINEERING
P. O. Box 6314
Albany, CA 94706
(415) 547-6612

PCS (Processor Control Systems)
Box 544
Celoron, NY 14720
(716) 664-2871

PERCOM DATA CO., INC.
318 Barnes
Garland, TX 75042
(214) 276-1968

PERSONAL COMPUTING CO.
3321 Towerwood Drive
Dallas, TX 75234
(214) 620-2776

POWER-ONE, INC.
Power-One Drive
Amarillo, CA 93010
(805) 484-2806

QUAY CORP.
P. O. Box 386
Freehold, NJ 07728
(201) 681-8700

RADIO SHACK (Div. Tandy Corp.)
700 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

REALISTIC CONTROLS CORP.
404 West 35th Street
Davenport, IA 52806
(319) 386-4400

RESEARCH TECHNOLOGY, INC.
4700 Chase
Lincolnwood, IL 60646
(312) 677-3000

ROCKWELL INTERNATIONAL
P. O. Box 17479
Irvine, CA 92713
(714) 632-3729

RONDURE COMPANY
2522 Butler Street
Dallas, TX 75235
(214) 630-4621

SD COMPUTER PRODUCTS
Div. SD Sales
P. O. Box 28810
Dallas, TX 75228
(214) 271-4667

SEALS ELECTRONICS, INC.
10728 Dutchtown Rd.
Concord, TN 37922
(615) 966-8771

SHUGART ASSOC.
435 Oakmead Pkwy.
Sunnyvale, CA 94086
(408) 733-0100

SMOKE SIGNAL BROADCASTING
6304 Yucca
Hollywood, CA 90028
(213) 462-5652

SOLID STATE SALES
P. O. Box 74
Somerville, MA 02143
(617) 547-4005

SOUTHWEST TECHNICAL PRODUCTS CORP.
219 W. Rhapsody
San Antonio, TX 78216
(512) 344-9778

SYLVANHILLS LAB INC.
P. O. Box 646
Pittsburg, KS 66762
(316) 231-4440

SYSTEX ENTERPRISES INC.
P. O. Box 402
King of Prussia, PA 19406
(215) 482-9481
(215) 631-1318

SZERLIP ENTERPRISES
1414 W. 259th Street
Harbor City, CA 90710

TEI INC.
c/o CMC MARKETING CORP.
5601 Bintliff #515
Houston, TX 77036
(713) 783-8880

TEXAS INSTRUMENTS, INC.
8600 Commerce Park Drive
Houston, TX 77036
(713) 776-6511

THINKER TOYS
1201 10th Street
Berkeley, CA 94710
(415) 527-7548

VECTOR ELECTRONICS CO., INC.
12460 Gladstone Avenue
Sylmar, CA 91342
(213) 365-9661

VECTOR GRAPHIC INC.
790 Hampshire Road A & B
Westlake village, CA 91361
(805) 497-6853

WWW ENTERPRISES
P. O. Box 548
Harbor City, CA 90710
(213) 835-9417

WAVE MATE
1015 W. 190th Street
Gardena, CA 90248
(213) 329-8941

APPENDIX C

References of Microcomputer Resources

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Buss. 325-B Pennsylvania Avenue SE, Washington, D.C. 20003. $7.50/year.

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Cloao Magazine. Box 1267, Goleta, CA 93017. $36/year.

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A SELECTED GLOSSSARY OF TERMS USEFUL IN DEALING WITH COMPUTERS*

This glossary attempts to explain certain terms with which one needs to be familiar in order to function successfully in the microcomputer environment. The terms have been selected from advertisements, catalogs, microcomputer manuals, dictionaries, textbooks, and conversations with persons who work with microcomputers. Included is a cross-reference category to refer the reader to terms which are closely related to the entry term. Hopefully this glossary will provide a launch pad from which you may pursue knowledge and use of microcomputers to the extent of your needs.

GLOSSARY

ACCESS TIME
The interval of time between the calling for information from a storage address and the delivery of that information. In general, tape has a longer access time than disc (or disk, as it is sometimes spelled).

ACOUSTIC COUPLER
A device attached to a computer terminal to transmit and receive audio tones via telephone lines. A type of modem.

ADDRESS
A label (name or number) that designates a location where information is stored in a memory device.

A/D INTERFACE
A/D (Analog/Digital) a circuit which changes an input voltage fluctuation (continuous), such as results from a musical tone, into digital information (discrete) for processing by the computer. It also converts digital information to analog.

ALGORITHM
An orderly step-by-step procedure, like a recipe, that consists of a list of instructions for accomplishing a desired result, or for solving a problem. Usually expressed in mathematical terms. In computer programming, an algorithm is expressed as a flowchart.

ALPHANUMERIC
A set of symbols. Can be letters (A-Z) and/or numerals (0-9), and/or special punctuation, mathematical, or graphic symbols.

ARCHITECTURE
The internal, preset arrangement or organization of a computer which determines how the computer operates. The interconnections of registers, logic units, control logic, etc. That which makes one microprocessor different from another.

ASCII
Pronounced "Ask-ee." American Standard Code for Information Interchange. Binary number codes for letters, numbers, symbols, and special characters that have been accepted as standard by the computer industry. This standard specifies which number will stand for each character. All personal computers use this standard. SEE: BAUDOT CODE, BCD CODE.

ASSEMBLER
A program which converts English commands or expressions, usually in mnemonics, into machine language in binary form for processing by the computer. Assembler language and assembly language are synonymous.

ASSEMBLY LANGUAGE
A computer language that uses mnemonic names to stand for one or more machine language instructions. Assembly language is similar to "shorthand," used to avoid the tedious use of long strings of zeros and ones found in machine language. The advantage of using assembly language instead of a high-level language, such as BASIC, is speed of execution, but a high-level language is usually easier for a human being to understand.

AUXILIARY MEMORY (STORAGE)
Storage available in a computer, in addition to its own memory banks; it can be either disc or tape. SEE: MASS STORAGE.

BASIC
An acronym for Beginners All Purpose Symbolic Instruction Code. A high-level conservation, interpretive, programming language in wide use. Always written in capital letters, BASIC was invented by Kemeny and Kurtz at Dartmouth College in 1963. It permits the use of simple English words and common mathematical symbols to perform the necessary arithmetic and logical operations to solve problems.

BASIC-IN-ROM
This term indicates that the programming language BASIC has been stored in ROM Memory.

BATCH PROCESSING
A method of processing information in logical groups.

BAUD
A rate of information flow. Given in bits per second (bps), the rate is the highest number of signal elements (bits) that a device is capable of transferring in one second between two devices. Alphabetic characters, for example being transferred at 300 baud corresponds to about 30 characters per second. Common baud rates are 110, 150, 300, 600, and 1,200 bps.

BAUDOT CODE
An obsolete processing code which uses five separate bits for each character. SEE: ASCII, BCD CODE.

BCD CODE
Binary Coded Decimal. A code which uses five bits for each character. SEE: ASCII, BAUDOT CODE.

BELT PRINTER
A printer which uses a steel belt with character impressions; the belt rotating at high speed. When a desired character is in the correct position, it is struck from behind with a stationary "hammer," thus imprinting the character on the paper. The belt printer forms a solid character. SEE: DAISY WHEEL PRINTER, INK JET PRINTER, MATRIX PRINTER.

BINARY CODE
Code using only zero and one to represent data. SEE: ASCII, BAUDOT CODE, BCD CODE.

BINARY SYSTEM
A number system based on the number 2, just as the decimal system is based on the number 10. The binary system is represented by the digits 0 and 1, and each place in a number represents a power of 2. SEE: HEXADECIMAL SYSTEM, OCTAL SYSTEM.

BIT
Binary Digit. The smallest unit of digital information. It has only two states: zero and one. A bit can be thought of as representing: a yes/no choice, a distinction between true and false, or whether a circuit is on or off.

BOOTSTRAP
A short sequence of instructions which, when executed by the computer, will automatically allow another longer program to be loaded from an input peripheral to the programmable memory of the CPU.

BPS
Bits Per Second. SEE: BAUD.

BRANCH
A place in a program where a choice is made to depart from the normal sequence of program instructions. The departure is made by a "branching instruction" in the program. A branching instruction may be one of two types: conditional or unconditional. In BASIC, an example of the first type is: IF...THEN; of the second type is: GO TO.

BUFFER
A space in a computer system where information is temporarily stored. Usually used to store small sections of data during a transfer process. For example, data may be read from a tape cassette in small units, placed in a buffer, then transferred to main memory when the computer is ready to process the data.

BUFFERED I/O
Input/Output operations using a buffer to increase speed. Because of the slowness of I/O devices, information is held in the buffer until enough has accumulated to make it worthwhile for the extremely fast CPU to act. SEE: BUFFER.

BUG
An error in programming which causes faulty outputs. May also mean a hardware malfunction or design error either in the computer or in its peripherals. SEE: DEBUG.

BULK STORAGE
Synonymous with mass storage.

BUS
A physical connection of parallel wires providing a communication line along which data can be sent. Usually shared by several parts of the computer. An S-100 Bus has 100 lines. In a unidirectional bus system, signals from one or more sources, activated one at a time, drive a common load or loads. A bidirectional bus system lets signals go either way on the bus, again activated only one at a time. Most microprocessor data buses are bidirectional.

BYTE
The basic unit of information in a computer. Commonly consists of a sequence of eight binary bits, usually handled as a unit. One byte usually represents one character. SEE: BINARY SYSTEM, WORD.

CASSETTE RECORDER
A device for preserving internally-stored information. Because most computers lose the information stored in them when they are turned off, a means of keeping the information is necessary. Binary information is stored on a cassette tape by first converting it to audio signals and recording it on the tape. This method of storage is slower than disc. SEE: MEMORY.

CHARACTER
Single items that can be arranged in groups to stand for information. There are two forms: (1) numbers, letters, graphic symbols, etc., that can be understood by human beings, and (2) groups of binary digits that can be understood by the computer. A character is usually represented by one byte.

CHARACTER CHECKING
A procedure for examining each individual character or group of characters to check for accuracy and consistency.

CHARACTER SET
Refers to the characters available to a computer, printer, or terminal. Some devices have only upper case letters plus numbers and a few special characters such as punctuation, #, 1, etc. Others have upper and lower case letters, numbers, and many special characters which may be combined to form designs. SEE: CHARACTER, GRAPHICS.

CHIP
The heart of a microcomputer, a piece of silicon smaller than one's fingernail on which thousands of electronic elements are implanted. Called a microprocessor, it contains all the circuits one needs to carry out the many computer operations.

CLOCK
A device, inside the computer, that times events and keeps them coordinated. It also controls the rate at which information is processed, a rate sometimes measured in nanoseconds or jiffys (1/60 of a second).

CODE
The relationship between bits and a set of characters. Microcomputers deal only with bits when executing a program. Therefore, letters, numbers, and other human understandable characters must be translated into bits. Each character has a bit code representation. The most commonly used code is that known as ASCII. Code is sometimes used as a synonym for program. For example: one may say that a programmer generates code. SEE: BAUDOT CODE, BCD CODE.

CODE LEVEL
The number of bits used to represent a particular character. SEE: ASCII, BAUDOT CODE, BCD CODE, CODE.

CODING
Preparing a set of computer instructions.

COMMAND
An instruction given to the system through an input device or peripheral. It is executed as soon as it has been received. SEE: PROGRAM.

COMPACTION
Packing information to make more space in the memory.

COMPATIBILITY
There are two types of compatibility: program and hardware. Program compatibility refers to the ability to run programs on a variety of computers without changing the program language. Hardware compatibility means that various components (printers, discs, keyboards, etc.) may be connected directly without intervening electronic devices and that all components use the same baud rate, word length, and other technical aspects in order to communicate.

COMPILER
A program built into the system that lets the computer translate instructions written in a high-level language, understood by a human being, into a machine-readable (object) program, meaningful to the computer. SEE: ASSEMBLER, INTERPRETER.

COMPILER LANGUAGE
A computer language more easily understood by a human being than an assembly language. Compiler language instructs a compiler to translate a source language into a machine language. SEE: ASSEMBLER, COMPILER, INTERPRETER.

COMPUTER
A device that receives and then follows instructions to manipulate information. The set of instructions and the information on which the instructions operate are usually varied from one moment to another. If the instructions cannot be changed, the device is not a computer. The difference between a computer and a programmable calculator is that the computer can manipulate text and numbers; the calculator can manipulate only numbers. SEE: MICROPROCESSOR.

COMPUTER LANGUAGE
A language used to communicate with a computer. All computer language instructions must be translated by a program in the computer into the machine's internal language in order for the instruction to be implemented. SEE: ASSEMBLER, COMPILER, LANGUAGE.

CONSOLE
The operating portion of a unit. SEE: HARDWARE.

CONTROL PANEL
Type of I/O device which allows the user to communicate and read computer memory in binary form using switches on the front panel. SEE: HARDWARE.

CONTROL UNIT
Portion of a computer which directs the operation of the computer, interprets computer instructions, and initiates the proper signals to the other computer circuits to execute instructions. SEE: HARDWARE.

COURSEWARE
A combination of content, instructional design, and the software which causes a computer to implement instructions. SEE: FIRMWARE, SOFTWARE.

CP/M
An operating system, a layer of software that masks the hardware and makes it "impersonate" a computer defined by CP/M itself. Allows enhancement of portability of CP/M developed software regardless of hardware compatibility.

CPS
Cycles Per Second.

CPU
Central Processing Unit. The heart of the computer, controlling what the computer does. It includes three main sections: arithmetic, control, and logic elements. It performs computations and directs functions of the system.

CROSS-ASSEMBLER
Program run on the computer to "translate" instructions into a form suitable for running on another computer. SEE: ASSEMBLER.

CRT
Acronym for Cathode Ray Tube. Similar in appearnce to a television screen. Information in the form of characters and graphic designs may be displayed on CRTs at the rate of 960 characters per second. A CRT terminal usually comes with a keyboard for entering information into the computer. SEE: VIDEO DISPLAY UNIT.

CURSOR
Movable indicator on CRT to indicate a specific character or space that is being displayed. The cursor lets the user know where the next character to be typed will appear.

CYLINDER
The tracks in a disc-storage system that can be recalled without having to move the access device.

DAC
Digital to Analog Converter. SEE: A/D INTERFACE.

DAISY WHEEL PRINTER
A printer which has a wheel mechanism, with characters on the perimeter of the wheel. The wheel rotates to place the appropriate characer in print position. A "hammer" strikes the character, forcing it against a ribbon, thereby forming an impression on the paper. The daisy wheel printer has the reputation of great reliability, is relatively inexpensive, and forms a solid character on the paper. SEE: BELT PRINTER, INK JET PRINTER, MATRIX PRINTER.

DATA
The information given to or received from a computer.

DEBUG
Process of finding, locating, and correcting mistakes or errors in a program that might create problems or provide inaccurate information. SEE: BUG.

DIAGNOSTIC ROUTINE
Test program used to detect and identify hardware malfunctions in the computer or its associated I/O equipment.

DIGIT
Either a zero or one in the binary number system.

DIGITAL COMPUTER
CPU that operates on specific data, performing arithmetic operations. Most computers store information in digital form, that is, as discrete units such as ones and zeros. SEE: A/D INTERFACE, BINARY SYSTEM, HEXADECIMAL SYSTEM, OCTAL SYSTEM.

DIRECT MEMORY ACCESS (DMA)
A technique for rapidly moving data from the microprocessor to a storage device such as a disc. DMA is accomplished at the direction of a program. Not all microcomputers permit DMA.

DISC (DISK)
A record-like magnetic-coated piece of material that can store programs, data, or tables of information. The process is similar to storing musical information on a magnetic tape. Commonly found are floppy and hard disc systems. SEE HARDWARE, TRACK.

DOCUMENT
A written description of a piece of software or hardware. It can also be used as a verb which is the process of producing such a description.

DOS
Disc Operating System. A collection of programs which are the operating system (OS) for a disc drive. SEE: DISC, TRACK.

DOT MATRIX
A method of generating characters by converting the ASCII code into a suitable group of dots arranged in a 5 x 7, 7 x 9, or other suitable patterned array. SEE: PRINTER.

DRIVER
Small program which controls peripheral devices and their interface with the CPU.

DUMP
Copying all or part of a memory onto another medium to retain the information yet clearing the memory for other activity.

DUPLEX
Process of establishing two-way communication simultaneously between components of a computer.

DYNAMIC MEMORY
A type of programmable memory which requires that the information on tiny capacitors inside integrated circuits be refreshed every so often to prevent the data from being lost. Generally uses less power and is cheaper and faster than static memory.

EBCDIC CODE
Eight-bit code system: Extended Binary Code Decimal Interchange Code.

ECHO CHECK
Error control method in which message is returned to sender for verification.

ECHO-PLEX
Form of error control which displays information given to computer.

EDITOR
A program which allows changing, modification, or movement of programming statements. It allows the programmer to write and modify instructions using the microprocessor and a terminal as a very sophisticated typewriter. SEE: TEXT EDITOR.

EPROM
Electrically Programmable ROM. A read-only memory which can be erased either by an electrical signal or by ultraviolet light. SEE: RAM, ROM.

ERROR
Difference in value between actual response and desired response in the performance of a controlled machine, system, or process.

ERROR TRANSMISSION
Change in information caused during data transmission.

EXECUTE
The running of a computer program.

EXECUTIVE CONTROL PROGRAM
Main system program designed to establish priorities and to process and control other programs; also called a monitor.

EXTERNAL STORAGE
Auxiliary storage such as tape or disc. SEE: MEMORY.

FAIL SOFT
System for protecting data against loss in the event of system failure.

FILE
Collection of related data.

FILENAME
Number/letter characters that identify a file.

FIRMWARE
Programs which are permanently stored in PROM memory to allow easier understanding of the computer's operation. The programs are loaded in ROM (ROM or PROM). Firmware is often a fundamental part of the system's hardware design, as contrasted to software, which is not fundamental to the hardware operation. SEE: EPROM.

FLOPPY DISC (DISK) DRIVE
A device for storing masses of information on a rotating, flexible, metallic-coated plastic disc which is similar to a 45 rpm record. Information can be stored and retrieved extremely fast. Unlike cassette tape, on which all information must be scanned, the disc allows the user to go to any area of the disc without searching through intermediate information. Floppy discs typically hold 256,000 bytes. SEE: TRACK.

FLOWCHARTING
A programming technique of using shaped blocks to indicate the sequence of operations in a program.

FORTRAN
Formula Translator. A science-oriented high-level language. SEE: ASSEMBLER, COMPILER.

FREQUENCY
Rate at which anything recurs. Usually measured in cycles per second or hertz.

FULL DUPLEX
Transmission and reception simultaneously. The telephone is a full duplex device. SEE: DUPLEX, HALF DUPLEX.

GIGO
Garbarge in, garbarge out. Implies that misinformation applied to the CPU will result in misinformation output.

GRAPHICS
Characters that can be used to form figures, shapes, and forms on the CRT or printer. In addition to letters and numbers, a computer may have a graphic character set, so arranged that they can be combined to form almost any desired figure. SEE: CHARACTER.

HALF DUPLEX
System of communication in which either transmission or reception can occur at a given time, but not both simultaneously. SEE: DUPLEX, FULL DUPLEX.

HANDSHAKING OPERATION
Interaction of the central processor and interfaced devices which requires the device to signal the processor as each comman occurs during data transfer. This operation is performed by modems or terminals to verify that channels are cleared and that operations can proceeed.

HARDCOPY
Data or information printed on paper. Used to distinguish between printed information and the temporary image found on the CRT. SEE: PRINTER, TERMINAL.

HARDWARE
Mechanical, magnetic, electrical, and electronic devices which make up a computer. The physical equipment that goes into a computer system, consisting of the central processing unit plus all peripherals.

HARDWIRED
Physically interconnected and usually intended for a specific purpose. Hardwired logic is essentially unalterable; a microprocessor, on the other hand, is programmable and may be adapted to accommodate various requirements.

HEAD
That part of a recorder that does the actual impression on the medium or reads that impression from a prerecorded medium.

HEXADECIMAL SYSTEM
A number system involving 16 characters, using numbers 0-9 and then letters A-F.

Decimal:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexadecimal:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

HIGH-LEVEL LANGUAGE
A computer programming language using English words, decimal arithmetic, and common algebraic expressions. Each instruction represents a large number of computer operations. SEE: ASSEMBLER, BASIC, COMPILER, FORTRAN.

HOLLERITH
Coding system which uses combinations of 12 positions on a card to represent characters. SEE: CODE.

IC
Integrated Circuit. A plastic or ceramic body five cm long, two cm wide, and three mm thick with up to 64 leads extending from it. Inside the body is a chip. The body protects the chip, and the leads allow electrical connection of the chip to other components. The word "chip" is not to be used to refer to the entire IC.

ICs come in three sizes: SSI (Small Scale Integration--less than 20 gates); MSI (Medium Scale Integration 20-200 gates); and LSI (Large Scale Integration--over 200 gates). Microprocessors use LSI.

INK JET PRINTER
In an ink jet printer, a high-speed stream of electrically charged ink droplets are fired through a magnetic field. The field deflects the droplets to direct them to the proper location on the paper. This type of printer is relatively expensive but extremely fast. SEE: BELT PRINTER, DAISY WHEEL PRINTER, MATRIX PRINTER.

INPUT
Information going into the computer or into a peripheral. The same data may be output from one part of the computer and input to some other part of the computer. When using this word, specify what the data are input to or output from.

INSTRUCTION
A set of bits, or a command, which will cause a computer to perform certain prescribed operations. SEE: PROGRAM.

INSTRUCTION SET
List of commands to which a given computer responds. Instruction sets may vary among computers, even though those computers use the same programming language. SEE: PROGRAM.

INTELLIGENT TERMINAL
Terminal with built-in programmable intelligence enabling it to pre-process information and/or instructions without the aid of a CPU.

INTERACTIVE
System capable of two-way communication with a user during operation. A system is interactive if it responds to the user quickly--usually less than a second. All personal computer systems are interactive.

INTERFACE
An electronic circuit used to connect one electrical device to another electrical or mechanical device to allow the flow of data between units. It refers to the matching or interconnecting of systems or devices having different functions.

INTERNAL STORAGE
Memory system which is a part of the computer, as opposed to external tape or disc storage. SEE: RAM, ROM.

INTERPRETER
A program used to translate languages at the time of processing. SEE: ASSEMBLER, COMPILER.

I/O
Input/Output of information in a computer system. Examples of I/O devices are: a keyboard, a floppy disc drive, and a printer.

JOB
That part of a program defined as a task for the computer, complete with all instructions, routines, data, and addresses.

KEYBOARD
A device for typing information into a computer. It is similar in design and function to a typewriter keyboard. The computer keyboard has several additional keys for specific computer functions. SEE: CRT, PRINTER, TERMINAL.

K or KILO
Symbol or suffix for 1,000. In dealing with computers, 1 K is used to mean 1,024. A computer with 32 K bytes of memory means that it has 32 times 1,024 bytes of memory.

LANGUAGE
A format by which a programmer can communicate more efficiently with a computer where predetermined commands will yield requested actions. BASIC is one of the most popular languages.

A language is a defined group of representative characters or symbols, combined with specific rules necessary for their interpretation. The rules enable an assembler or compiler to translate the characters into forms (such as digits) meaningful to a machine, system, or a process. SEE: ASSEMBLER, BASIC, COMPUTER LANGUAGE, COMPILER, FORTRAN, HIGH-LEVEL LANGUAGE, INTERPRETER.

LIBRARY ROUTINES
Collection of standard routines that can be used in programs.

LINE FEED
The technique of a teleprinter that advances the paper one line at a time.

LOAD
Process of inserting information in memory. Opposite of "dump."

LSI
Large Scale Integration. Technique of making more complex integrated circuits. Refers to a component density of more than 200 transistor gates per chip. SEE: IC.

MACHINE LANGUAGE
A programming language whose instructions are written in binary, octal, or hexadecimal notation. Programs written in machine language do not need to be translated in order for the computer to execute the instructions. SEE: ASSEMBLER, ASSEMBLY LANGUAGE, COMPILER, INTERPRETER, LANGUAGE PROGRAM.

MACROINSTRUCTION
An instruction which causes the computer to execute one or more other instructions. These "other instructions" are called microinstructions. SEE: INSTRUCTION.

MAGNETIC TAPE
SEE: TAPE.

MAIN MEMORY
That memory which is directly accessible to the computer. It contains the operating system, programs, and data being processed. In a microcomputer, main memory is referred to as RAM OR ROM. SEE: MASS STORAGE.

MASS STORAGE
Devices such as discs or tapes are used to store large quantities of data. These devices are not directly accessible for processing by the computer, therefore the data which are stored must be read into main memory before the computer can use it. SEE: STORAGE CAPACITY.

MATRIX PRINTER
The matrix printer is so-called because it forms characters from a matrix of dots. Usually the matrix consists of five dots across and seven dots down or seven dots across and nine dots down. The 5 x 7 matrix is suitable for upper case letters and numbers; however, for lower case letters and other characters, the resolution provided by the 7 x 9 matrix is better. Matrix printers have the advantage of being lower in cost than other types but are also slower in print rate. SEE: BELT PRINTER, CHARACTER, DAISY WHEEL PRINTER, INK JET PRINTER, PRINTER.

MEMORY
The integrated circuits of a computer which store information. In a microcomputer, these are referred to as RAM and ROM. SEE: IC, WRITE.

MEMORY CHIP
A chip which stores data in the form of electrical charges. SEE: MOS CHIP, RAM, ROM.

MICROCOMPUTER
A hardware configuration usually acquired in one of three ways: (1) by constructing several components from individual electronic parts (as in building a stereo system from a kit); (2) by connecting several already-constructed components (as in purchasing a separate amplifier, speaker, and turntable); or (3) by purchasing a unit with built-in components (as in buying a complete stereo system in one package, plugging it in, and using immediately). The end-product of the microcomputer is information. It records this information, processes it, puts it into meaningful terms, communicates it, stores it, and retrieves it when needed. It usually includes the microprocessing unit, a keyboard for entering data, a cassette tape recorder or a disc for storing programs, and a TV-like screen for displaying results. SEE: CPU, CRT, DISK.

MICROPROCESSOR
An integrated circuit that can execute instructions. It is one component of a microcomputer. It is the brains of the central processing unit (CPU).

MICROPROCESSOR BOARD
A board (actually made of plastic) to which are attached integrated circuits, including microprocessor chips, which form the microprocessor. SEE: IC.

MICROSECOND
One microsecond equals one millionth of a second. This is the speed at which some computers get and execute instructions. SEE: NANOSECOND.

MODEM
An abbreviation of the words "MOdulator-DEModulator." It is a device which permits computers to transmit information over regular telephone lines. Digital electronic signals, generated by the computer, are converted by the MODEM into high and low tones. This process is known as "Modulation." The tones are a type of analog signal. The modem also converts analog signals to digital signals. SEE: HANDSHAKING OPERATION.

MODULATOR
An electronic device that allows a normal television set to be used as the video display unit. Frequently referred to as RF Modulator.

MONITOR
1. A video display unit which uses a cathode ray tube to generate characters. It looks much like a normal TV set; however, the monitor has a much higher degree of resolution, which permits a clear formation of very small characters on the screen.
2. A program which oversees the operation of other programs.

MOS CHIP
MOS is an acronym for metal oxide semiconductor. A MOS chip is a chip in integrated circuit (IC) which can perform a vast number of electrical operations. A MOS chip one-quarter of an inch square can perform operations equivalent to 6,000 discrete electronic devices. A chip this size has the power and ability of a room-sized computer of a few years ago. SEE: IC.

MOTHER BOARD
A card in a microcomputer with connections for various components and which is connected to the microprocessor. It forms the interface or connecting link between memory and peripheral devices.

MSI
An abbreviation for Medium Scale Integration. Refers to the quantity of circuit components, such as transistors, formed on a single circuit. SEE: IC.

MULTI-PROCESSING
Refers to more than one microprocessor executing different programs simultaneously. A computer system may contain more than one microprocessor, thus multi-processing may occur within that system.

MULTI-PROGRAMMING
A microcomputer can be multi-programmed if two or more programs are present in main memory. Because the microprocessor operates so rapidly, it appears that each program is run simultaneously.

NANOSECOND
One nanosecond equals one thousandth of one millionth of one second or 1×10^{-9} seconds. This is the speed at which many computers get and execute instructions. SEE: MICROSECOND.

NOISE
Refers to inaccurate data transmission. This causes typographical errors in output. SEE: BUG, DEBUG.

NON-VOLATILE MEMORY
A type of memory which maintains data without requiring refresh. Tape and disc are tow media of non-volatile memory. Some types of RAM are also able to hold data and are frequently referred to as static memory. SEE: DYNAMIC MEMORY, VOLATILE MEMORY.

OBJECT PROGRAM
The form of a program which can be understood by a computer. The object program results from the translation of a human readable program, called source program, into a machine language program. An object program appears as a series of numbers when printed or displayed. SEE: ASSEMBLER, COMPILER, INTERPRETER.

OCTAL SYSTEM
Refers to a numbering system which has a base of eight compared to the decimal system which has a base of ten. Octal numbering is a compact means of representing binary numbers. The following illustration shows the relationship between octal and decimal numbers:

Decimal:	0	1	2	3	4	5	6	7	8	9	10
Octal:	0	1	2	3	4	5	6	7	10	11	12

Octal numbers are identified by a subscript $11_{10} = 13_8$ 11 (decimal) = 13 (octal)
SEE: CODE, HEXADECIMAL.

OFF-LINE
Refers to data which are stored on devices not immediately accessible to the computer. Data stored on magnetic tape, punched cards, or paper tape must be loaded into on-line storage to be available to the computer.

ON-LINE
Refers to the location of data on storage devices which are immediately accessible to the computer. Usually on-line data are stored on discs, in RAM, or in ROM. Data which is off-line must be loaded into on-line storage for use.

OPERATING SYSTEM (OS)
A set of programs that are resident in a computer and facilitate using the attributes of the computer. An operating system typically controls the I/O functions such as managing the keyboard. A disc operating system is referred to as DOS.

OS
SEE: OPERATING SYSTEM.

OUTPUT
Information emanating from a display unit such as a CRT or printer. SEE: INPUT.

PAPER TAPE
SEE: TAPE.

PARALLEL CONNECTION
An electronic connector which allows the microcomputer to communicate with peripheral devices (printers, keyboards, etc.). A parallel connection transmits data in parallel mode, that is, all bits of information are sent simultaneously. If the microcomputer is sending in parallel mode then the peripheral device must receive in parallel mode, and vice versa. SEE: SERIAL CONNECTION.

PARALLEL DATA TRANSMISSION
Microcomputers handle data in groups of eight or sometimes 16 bits. These groups are called words. Parallel transmission refers to passing words from one component to another as an intact group. An eight-bit word would be transmitted as eight simultaneous bits along eight parallel wires. SEE: PARALLEL CONNECTION, SERIAL CONNECTION, UART.

PERIPHERAL DEVICE
A device, such as a printer, mass storage unit, or keyboard, which is an accessory to a microprocessor and which transfers information to and from the microprocessor.

PERSONAL COMPUTER
A microcomputer designed for use by an individual for entertainment, instruction and bookkeeping chores.

PLOTTER
A peripheral device which draws two-dimensional shapes on paper. Some plotters also use colors.

PORT
The two most common types of ports are RS232 and 20ma (read twenty milliamps). These ports are frequently referred to as I/O ports (input/output ports) and are the connections through which the computer communicates with the outside world. Thus, ports are the "plugs" which connnect the computer to peripheral devices such as keyboards and printers. SEE: PARALLEL CONNECTION, SERIAL CONNECTION.

PRINT MECHANISMS
SEE: BELT PRINTER, DAISY WHEEL PRINTER, INK JET PRINTER, MATRIX PRINTER.

PRINTER
A peripheral device which accepts output data from the microprocessor and prints characters on paper. Printers are defined as impact or non-impact depending on the means by which a character is formed on the paper. Impact printers strike the paper through a ribbon in a manner similar to a typewriter. Non-impact printers form characters by various means such as heat, electrical charges, or spraying ink. SEE: BELT PRINTER, DAISY WHEEL PRINTER, INK JET PRINTER, MATRIX PRINTER.

PROGRAM
A series of instructions to a computer which cause the computer to solve a problem of perform a task. SEE: ASSEMBLER, BASIC, COMPILER, EXECUTIVE CONTROL PROGRAM, FORTRAN, INTERPRETER, LANGUAGE, MACHINE LANGUAGE, ROUTINE, SUB-ROUTINE.

PROM
An acronym for Programmable Read Only Memory. A type of permanent or static memory made of an integrated circuit which can be programmed after it has been manufactured. Programming a PROM consists of permanently recording data or instructions on the chips which make up the PROM. SEE: EPROM, RAM, ROM.

RAM
An acronym for Random Access Memory. Any memory which can be written on or read from by a program and in which the memory locations can be accessed in a random sequence. RAM can be erased and reprogrammed by the programmer as frequently as necessary. RAM size is expressed as a quantity of bytes such as 4K (4,000 bytes). RAM may be expanded by adding memory chips or memory boards. SEE: EPROM, PROM, ROM.

RANDOM ACCESS MEMORY
SEE: RAM.

READ
The act of retrieving data from memory or from an input/output device.

REFRESH
The process whereby volatile memory is constantly charged with electrical current. This keeps the bit pattern of the memory in proper order thereby maintaining the data which are stored. Without refresh, the memory would lose electrical charge, consequently losing the stored data. SEE: MEMORY, RAM, ROM.

REGISTER
A temporary storage device located in the microprocessor which can hold computer bits or words.

RESPONSE TIME
The interval of time required for the microprocessor to respond to an instruction or an input from a peripheral such as the keyboard. In an educational environment, the time interval from the activation of the keyboard to a display on the CRT should be less than three seconds.

REVERSE DISPLAY
Attribute of a CRT which permits characters to be displayed either as white on black background or black on white background. SEE: VIDEO DISPLAY UNIT.

RF MODULATOR
SEE: MODULATOR.

ROM
An acronym for Read Only Memory. It is made of an integrated circuit on which data or instructions are programmed at the time of manufacture. It cannot be erased or reprogrammed by computer operations. The size of ROM is expressed as the quantity of bytes, for example, 12K (12,000 bytes). SEE: EPROM, PROM, RAM, STORAGE CAPACITY.

ROUTINE
A series of instructions within a program which performs a specific subtask of the program. A routine is usually performed only once during the execution of a program. SEE: SUBROUTINE.

RS232
The name of a type of port which permits serial transmission of data to a peripheral device. The RS232 Interface has been standardized by the Electronics Industry Association and is found on many microcomputers.

RUN
Jargon for execute.

SCROLLING
A technique of displaying data on a CRT screen. Each line of data appears first at the bottom and moves upward as new lines are displayed. Eventually the line disappears off the top of the screen.

SERIAL CONNECTION
An input/output port which allows serial transmission of data. In this serial transmission mode, each bit of information is sent individually. If a peripheral device receives in serial mode, then the microcomputer must send in serial mode, and vice versa. SEE: PARALLEL CONNECTION, SERIAL DATA TRANSMISSION.

SERIAL DATA TRANSMISSION
A means for transmitting computer words by sending bits individually in sequence. Whereas in parallel data transmission, the bits are carried along parallel wires, in serial transmission only one wire is used; therefore, bits are sent and received singly. SEE: PARALLEL CONNECTION, PARALLEL DATA TRANSMISSION, SERIAL CONNECTION.

SOFTWARE
Refers to programs and accompanying documentation. Software is stored on tape cassettes or discs when not being used by the computer. The computer reads the software into its memory in order to use the programs.

SOURCE PROGRAM
A program written in a language such as BASIC, FORTRAN, or COBOL. The source program must be translated via a compiler, interpreter, or assembler into a machine language object program. The language of a source program is symbolic, that is, the instructions are represented by words or mnemonic devices which are readily understood by humans.

STATIC MEMORY
A type of programmable memory which changes only when an electrical charge is applied. It is often found in a MOS chip. It does not require refresh operations as does dynamic memory. SEE: RAM, ROM.

STORAGE CAPACITY
The quantity of bytes a storage device can hold. It is usually expressed in kilobytes which is abbreviated KB. Thus, a disc is said to have a storage capacity of 400KB (400,000 bytes). This can be understood as 400,000 characters such as letters, numbers, spaces, etc. SEE: MAIN MEMORY, MASS STORAGE, MEMORY.

STORAGE DEVICE
A peripheral device which holds information. This includes tapes and disc. SEE: WRITE.

STORE
This term refers to the process of placing data onto some type of storage device. Usually the data are to be kept permanently; therefore, they are placed in a non-volatile memory such as a tape, disc, or static memory ROM. SEE: DYNAMIC MEMORY, VOLATILE MEMORY.

SUBROUTINE
A portion of a program which performs a specific subtask. A subroutine is usually called upon several times during the execution of the program of which it is a member. SEE: ROUTINE.

TAPE
There are two types of tapes used with microcomputers: (1) paper tape, and (2) magnetic tape. Each is a type of storage device which is often used for mass storage. Data are stored on paper tape by punching holes into the tape. A character is represented by a certain pattern of holes. On magnetic tape, patterns of electrical charges represent characters. SEE: MEMORY.

TERMINAL
A peripherical device which facilitates human communication with a computer. Usually it consists of a keyboard with alphabetic and numeric characters coupled with a printing mechanism or a CRT. One enters information via the keyboard; the computer responds via the printer or CRT.

TEXT EDITOR
A system of programs which facilitate editing. The functions available usually consist of adding text, deleting text, searching for specified text, paragraphing, and page layout. SEE: EDITOR.

TRACK
The area of a disc on which magnetic pulses are recorded. These magnetic pulses are the electrical analog of bits or the information which is stored. A track is analogous to a groove on a music recording. Information is written onto a track and read off the track by means of a magnetic head in the same way a tone-arm "reads" a musical recording. Instead of a needle, the magnetic head has metallic pads that create (write) or sense (read) magnetic pulses. SEE: MEMORY, PERIPHERAL DEVICE, STORAGE CAPACITY.

UART
Acronym for Universal Asynchronous Receiver Transmitter. This device converts parallel data transmission to serial data transmission, and vice versa. SEE: PARALLEL CONNECTION, SERIAL CONNECTION.

VDU
Abbreviation for Video Display Unit.

VERTICAL SCROLLING
A method of displaying text on a video display unit (VDU). In the case where more text is stored than can be displayed on a screen, the text is "scrolled," that is, moved up or down on the screen. When scrolled up, the text disappears off the top of the screen; when scrolled downward, the text rolls off the bottom.

VIDEO DISPLAY UNIT
A component of a microcomputer system which displays the output on a screen similar to a TV screen. A television monitor is a type of video display unit. SEE: CRT (CATHODE RAY TUBE), MODULATOR.

VIDEO MONITOR
SEE: VIDEO DISPLAY UNIT.

VOLATILE MEMORY
A memory device which does not retain information after electrical power is lost. RAM is a type of volatile memory. SEE: DYNAMIC MEMORY, REFRESH, ROM.

WINDOW
Refers to partitioning a computer display into independent segments. A CRT screen may be divided into segments, one of which may contain explanatory text, another pictures or other graphic symbols, and the third segment representing questions pertaining to the text and pictures. The fourth segment could present responses to the student's answers to the questions. The contents of each segment or window could be varied independently of any other window.

WORD
A grouping of bits. Words may consist of eight bits or 16 bits. Computers read, store, and manipulate data in words rather than as individual bits. SEE: WORD LENGTH.

WORD LENGTH
The number of bits in a word. Most microcomputers have a word length of eight bits, though a 16-bit word length is also available from some manufacturers. SEE: WORD.

WRITE
The act of delivering information to a memory device or a storage medium. SEE: READ.

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*Glossary developed by Charles H. Douglas, Associate Professor of Music, and Johns S. Edwards, Coordinator, Instructional Computing Services, both at the University of Georgia, Athens, Georgia; and Russ Wilkins, Agricultural Education, University of California, Davis, California.

Appendix C. Workshop Registration Forms

Microcomputer Workshops for Agriculture

Program

Preregistration

Introductions

"Microcomputer Resource Guide in Agricultural Education"

Microcomputer Terminal Familiarization

Data File/Sort Program - Group Participation

Break

Resource Program (Software) Index - Program Review

Subject Matter Selection - Problem Sets/Worksheets

Lunch (Reservations at nearby restaurant - No Host)

Software Worksheet (continued)

Microcomputer Selection Criteria

Language Review

Networks

Conclusions

The workshops are emphasizing both individual "hands-on" participation and introductory level material. No prior knowledge of computers is necessary for participation. However, opportunity to review agriculture programs will be available for more advanced individuals as well.

In addition, the Microcomputer Resource Guide will be supplied which includes: current use of microcomputers; hardware/software descriptions; purchase criteria guide; description of networks, data base files and user groups; lists of manufacturers, addresses of user groups, and a glossary of microcomputer terminology; and an index of computer programs by subject matter.

Please check the appropriate boxes and return the preregistration for each individual instructor participating. A confirming letter will be mailed to each individual preregistering containing the address, specific times and general information.

Preregistration Form

Return to: Agricultural Education
ABS, AOB IV
University of California
Davis, CA 95616

✓ appropriate box

- ☐ Jan. 10, Canoga Park
- ☐ Jan. 17, College of Sequoias, Visalia
- ☐ Jan. 24, Sacramento

Name _____

Address _____ 123 Community College

✓ subject matter emphasis

- ☐ Agric. Production (Animal)
- ☐ Agric. Production (Plant)
- ☐ Forestry
- ☐ Ag Business
- ☐ Ornamental Hort.
- ☐ Rural Recreation/Natural Res.
- ☐ Products/Processing
- ☐ Other

"Registration Deadline December 15"

Microcomputer Workshop
For
California Community College
Agriculture Instructors

Agenda
January 10, 1981

9:00	Opening Remarks Introductions
9:15	Program Overview
9:30	Microcomputer Awareness
10:00	Radio Shack Teacher Grading Program (Program Management)
10:30	Reedsort
11:30	Machine Costs (Agricultural Economics)
12:00	Lunch
1:15	Continue Machine Costs (Agricultural Economics)
1:45	Animal Science Program
2:15	Crops (Grainstr)
2:45	Additional Programs, Networks
3:15	Languages (Basic Versions, CP/M, DOS, PEARL)
3:30	Systems - Purchase Options
3:45	Evaluation
4:00	Adjourn

Program Participants

Steve Cullin	Manager, Radio Shack Educational Facility
Jim Leising	Project Director, Teacher Educator, University of California, Davis
Bill Michaud	Teacher Educator, Cal Poly, San Luis Obispo
Jack Schmidt	Computer Consultant, Canoga Park
Russ Wilkins	Project Coordinator, University of California, Davis

Appendix D. Workshop Agendas

University of California, Davis

Microcomputer Workshop
For
California Community College
Agriculture Instructors

Agenda
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Appendix E. Internal Formative Evaluations

Agricultural Education
Department of Applied Behavioral Sciences
University of California, Davis

Evaluation of Microcomputer Workshop

Circle the number that best describes your reaction to the various aspects of the workshop:

	Excellent		Average		Poor
1. How well did the workshop provide "hands-on" experience with the micro-computer?	5	4	3	2	1
2. The Micro-computer Resource Guide.	5	4	3	2	1
3. Opportunity to review software programs in Agricultural subject areas.	5	4	3	2	1
4. Opportunity to learn about micro-computer language and terms.	5	4	3	2	1
5. Opportunity to learn about computer networks	5	4	3	2	1
6. Over-all rating of workshop	5	4	3	2	1

General Comments

7. Beyond this workshop, what is needed to increase the awareness and use of micro-computers in community college agricultural programs?

Evaluation of Microcomputer Workshop

Canoga Park

		5	4	3	2	1
1.	How well did the workshop provide "hands-on" experience with the micro-computer?	6	12	2		
*2.	The Micro-computer Resource Guide.	13	5	1		
**3.	Opportunity to review software programs in Agricultural subject areas.	3	4	10	1	
4.	Opportunity to learn about micro-computer language and terms.	5	3	8	3	
5.	Opportunity to learn about computer networks	2	11	5	1	
*** 6.	Over-all rating of workshop.	6	9	4		

GENERAL COMMENTS

* Cross reference programs which might apply to more than one area or could be adapted.

** Would like opportunity to review more programs (would require more time).

Good job!!; Should try to eleviate "Bugs" on the program they are using as a teaching guide.

More!; Get the bugs worked out -- we realize this is the first shot.

Good workshop - slow down and be more basic; too much material covered; perhaps a series of workshops.

Good intro but really needs more direct use and how to use or operate; How to put info in and take info out and more on uses.

Would like more time to use actual programs; probably need more than 1 day

Time not adequate for such an objective (Questions 3 and 4)

The program on Forestry was too difficult for us beginners.

Very interesting with obvious potentials.

Possibly because my field is more ornamental horticulture, I felt that many of the programs could have been more appropriate than what was presented.

Excellent guide development; I will need further training to fully utilize.

Class size cut in half; When instructor is talking make sure others are not talking; Would be more desirable to have one computer per student (GREAT - JIM AND RUSS)

***(Good in idea, poor in execution) Needed a map to this place; Should be a 2-day seminar--1 day for total neophytes (This is a keyboard."Enter" does this. etc; 1 day for programming, software adaptation, etc.

Very well put-together. Instructors were very good and presented subject matter in logical form I enjoyed it. I feel much more knowledgable in the area of computers.

2-day seminar rather than 1; get more basic for language, etc.; 2 sections--beginners/advanced.

WELL DONE

This was an excellent workshop, especially in light of the large volume of materials you were attempting to present. In the future, more specific topics would be suitable for one-day sessions.

List of programs used at the community colleges of this state; What programs can be used in different ag firlds, etc. Ag Mech, OH Mech, OH Ag Business; Would like workshop put on by Radio Shack people.

7. Beyond this workshop, what is needed to increase the awareness and use of micro-computers in community college agricultural programs?

In the future, more specific topics would be suitable for one-day sessions. Example:
(1) Utilization of software packages in various instructional areas--Ag Bus, N.R., Hort., Ag Sci, etc.
(2) Dept. Applications - Record-keepers, Grades, Exams, Budgets, Mailing lists, Inventory
(3) Specific hardware available - updating
(4) Use of networks
(5) Intro to programming -- More workshops

Additional workshops, perhaps in a sequence from Introductory to Advanced in several steps. Also mailing a glossary ahead of time would allow us to come to the workshop better acquainted. Yearly update of new programs w/opportunity to review.

2-3 day course to help us construct our own program - a step-by-step class. Perhaps (a) a 1 week course (b) 3 or 4 series of weekends for credit

Continue workshops and offer advanced training in Micro-computer use; Need for more software with agriculture application (horticulture & animal health tech.); How to write programs.

More on-hands workshops; start basic and grow; education programing; purchase Radio Shack's trainers!

How with coop methods info can become readily available; methods of interchange & use at low cost to each unit; develop uses across on hardware.

More soft-ware; possible use of Radio Shack instructors for Level I training for inservice.

Awareness of the power of the computer in all ag related areas needs greater communication effort, i.e. local workshops for ag teachers; teachers need contact with computers and the notion that one does not need to be a math major or mental giant to use/program a computer has to be covered; maybe field trips to "Ag areas," farms, sites?; where computers are used for motivational purposes could be organized. Instructors that use computers in instruction could be brought together in a forum situation and expose others generating some enthusiasm.

(Not sure why Radio Shack--Apple if language is BASIC); like to leave more information on transferring Radio Shack's programs to Apple or other types.; I am interested in writing programs in Ag Mechanics and would like more information of what has already been done.

Vaster exposure; Disks with basic information on each area of agriculture, for me, OH

Possibly more information as to what is <u>currently</u> available in both soft and hardware could be made <u>readily</u> available to instructors (I have only been teaching 1-1/2 years and I may not realize what is available); Personally, I feel that as a result of this workshop, I will very probably purchase a computer.

More basic info -- workshops; review basics -- pursue the same course -- program development in Ag Eng, esp. Irrigation - Soils - Climate - E.T.

Daily use for a coupe of weeks after that at least once a week for a couple of months.

Workshops for use & programming - more in-depth. Software for specific areas of agriculture (my special interest is animal science). 2 areas of emphasis: 1 for self-taught subjects, especially on areas where repetition is needed (such as math problem-solving; also terminology) 2nd for flexible programs that can generate teaching aids (e.g., something to make a crosswork puzzle)

More hands-on experience; Workshop in elementary BASIC; more on classroom use and applications.

Series of basic workshop; Basic programs for Ag.

Longer courses - more depth on programs in agriculture.

Software development in Ornamental Horticulture.

EVALUATION OF MICRO-COMPUTER WORKSHOP

January 17, 1981

	Excellent		Average		Poor
	5	4	3	2	1
1. How well did the workshop provide "hands-on" experience with the micro-computer?	6	9	4		
2. The Micro-computer Resource Guide.	7	7	5		
3. Opportunity to review software programs in Agricultural subject areas.	2	6	10	1	
4. Opportunity to learn about micro-computer language and terms.	7	7	6		
5. Opportunity to learn about computer networks	3	9	6	1	
6. Over-all rating of workshop	2	12	4		

General Comments

Some of the lecture material was a little "heavy" for beginners.
We need to have all possible sources checked for software.
The workshop was well organized, but at times was a little too deep for the beginner. The time periods should have been a little more to schedule. Nice workshop overall.
Some language used by instructors was beyond my comprehension. In many cases, this was frustrating and, at times, confusing. I appreciated the effort put forth by the instructors. They certainly were well prepared.
My first experience -- Overwhelming!! Possibly doing again would help me.
Much of the material was over my head in the morning session. It was challenging however.
Need to have more simple programs to go through. I felt too much time was spent on technical background. It was a good introduction but too much time for lunch. Two hours too long. The schedule could have been followed a little closer. "More simple programs."
Good approach to this unique subject.
Too technical at times!
The programs were too difficult. Also I would like to have learned how to change an existing program. I didn't
Some terms were too technical.
Very good - a very good start for me. Could have given instruction on how to use disk system on a unit.
Would like to see computer use workshop at Summer Conference

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7. What is needed to increase awareness and use of micro-computers?
Develop programs - are any grants still available for writing programs? Additional training sessions within our area of instruction
Workshop on programming and editing programs.
More individual instructions on individual computer applications.
An annual update covering several areas of micro-computers is needed. Also a sharing of ideas from the various community colleges on how micro-computers are used and the type of programs used. Very good presentation!
Full week class with one person at each unit.
Have not used the computer enough to judge.
More on software; more on modifying or adapting existing programs to our use; management uses as well as educational uses; (inventories, etc.).

Need to do over - too much to comprehend.
How to program an Ag. program.
Self study or a formal course.
How to write programs??
Develop software or find more.
Programming schools would be extremely valuable. Also more incentive (grants?) to develop more software.
We probably need more time for hands-on experience with available programs.
Development of software for use in ag. classroom; work in forms that can be used by non-expert operators.
Need to provide mechanism to keep new software package available to instructors.

Agricultural Education
Department of Applied Behavioral Sciences
University of California, Davis

January 24, 1981

Evaluation of Microcomputer Workshop

Circle the number that best describes your reaction to the various aspects of the workshop:

	Excellent 5	4	Average 3	2	Poor 1
1. How well did the workshop provide "hands-on" experience with the micro-computer?	17	2	3		
2. The Micro-computer Resource Guide.	16	4			
3. Opportunity to review software programs in Agricultural subject areas.	5	13	1		
4. Opportunity to learn about micro-computer language and terms.	8	7	5		
5. Opportunity to learn about computer networks	3	10	5	1	
6. Over-all rating of workshop	14	4	3		

General Comments

Very well done for a beginner like me.
Outstanding. Need more!
Very well done.
It is very tough to take such a diverse group of people at one time.
Excellent program--I would like an expansion of the areas that we just touched on.
Good Place for me to start.
Received a real good overview of computer and the possible applications in Ag Ed; A preview prior to today on terminology of computer may be helpful; Went too fast for beginner; Need one computer per person.
Well planned and run, excellent facilities (no facilities=no workshop!); excellent instructor.
We might need some general information before we get here; Don't know enough to even ask questions.
I would have preferred not to take so long for lunch - even tho it was a very nice place--

(OVER)

7. Beyond this workshop, what is needed to increase the awareness and use of micro-computers in community college agricultural programs?

We need specific programs on Ag Business that are problem-solving and involve management decision making--game type situations; Also, same type needed for various marketing situations.
Think we should have J.C. Ag Dept Network!
Workshop for Animal Science; Run various programs.
Would like to see workshops in specific fields such as listed in Resource Guide--might have to run several closely related fields together in order to have a large enough group. WELL DONE!
Programming and use of software
Another workshop.

(OVER)

6. General Comments - continued

but I feel when you devote a Saturday, we should go full bore and then be on our own time; When the woman was talking about R.S. we were looking at the catalogs--I would pass literature out after the explanation. Very good day well spent.

A good start for me--kind of overwhelming, but good basic information--as I have time to sort out and be able to apply.

Very informative. Would like to do more in my area of specialization.

Very good job; There is great importance in this field. For an introductory course the experience was good.

An excellent opportunity to realize and appreciate the capabilities of a micro system; Nice job!

Computer Networks sound very interesting--more info needed.

Excellent program--a job well done; Thank you Jim and Russ.

Very good introductory workshop; stimulated my interest in what is available and capacity of machines.

7. -- continued

Programs and use of programs (i.e. hands on) software; share programs among colleges?

Need more workshops.

We need programs written very much. I would suggest the next money be spent on hiring people to develop the programs as developed from a survey of the needs of people that attended the classes.

Possible - classroom use - demonstration workshop - continuing update of software programs that are available.

More hands on use of the various special programs for Ag and how to apply them.

Training for instructors, convince administration of its necessity and future.

Establish an exchange network between California Community Colleges and the University system, perhaps on a 6-month interval; The resource guide should be continually updated.

More info on integration of components: Disks, cassettes, computer, modern, networks; Still a little vague to me.

Have Ralph get out to campuses that aren't involved. Continue to add to the resource guide.

A course (workshop) in basic programming.

Appendix F. Summative Evaluation Instrument

Assessment of the Micro-computer

Resource Guide for Agriculture

1. Do you have access to or are you aware of the Micro-computer Resource Guide developed at the University of California, Davis in January, 1981? (Circle yes or no on the right. If no, do not complete this questionnaire.) yes no

	not at all	slightly	moderately	greatly
2. To what extent have you used the Micro-computer Resource Guide in teaching or preparing to teach agricultural classes, or up-dating yourself professionally? (Circle the term on the right that best describes your extent of use.)	1	2	3	4

3. How could the Micro-computer Resource Guide for Agriculture be improved to meet your needs? Please comment:

4. What type of inservice education would be helpful in the area of micro-computers to allow you to fully implement this teaching strategy in the classroom? Please comment:

Appendix G. Attendance at Workshops

VOCATIONAL EDUCATION PERSONNEL TRAINING

PARTICIPANT SUMMARY FORM

1) Title of Project Inservice Workshops on New and Emerging Agriculture/Natural Resources Occupation Instructional Materials

2) Name and Address of District, College, or School University of California, Davis
Department of Applied Behavioral Sciences

3) Name of Project Director and Title Dr. O. E. Thompson, Professor
Dr. J. Leising, Teacher Educator, Agricultural Education

4) Project Number CC-3-0-353

5) Total Number of Participants (Unduplicated count) 69

6) Total Participant Hours (Total number of hours of conducted training actually attended and totaled for all participants) 414

Please Classify the Total Number of Participants by the Following Types:

7)

PARTICIPANTS	American Indian		Black		Chicano		Oriental		White & All Others		TOTALS
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Teacher	0	1	0	0	2	1	1	0	45	4	
Supervisor											
Paraprofessional											
Counselor											
Administrator									2		
Media Specialist											
County Staff											
State Staff									1		
Other (Specify)									2		
TOTALS											

8) LEVEL

Junior High _____ ROP/C _____ Community College 65
High School 2 Adult _____ Other (Specify) 2 non-teaching

9) COMMUNITY

Urban 19 Suburban 25 Rural 25

10) On a separate sheet, please list all local educational agencies represented in training activities and the number of participants from each agency.

ATTENDENCE BY LOCAL EDUCATION AGENCY

Agency Name	Number of Individuals
Pierce College	6
Mt. San Antonio	3
Mira Costa	2
Antelope Valley	2
Santa Barbara	2
Orange Coast	2
Cuyamaca	1
College of Desert	4
West Hill	2
Allen Hancock	1
Shasta College	8
Butte	8
Solano	1
Santa Rosa	3
Diablo Valley	1
Hartnell	1
Merritt	1
Yuba College -- Woodland	1
Modesto	3
Durham High School	1
Merced	2
Delta	3
Sierra	2
Etna High School	1
University of California, Davis	1
California Community Colleges Chancellor's Division	1
CCSF	2
Yuba	1
Princeton	1

Microcomputer Workshop Attendance

Canoga Park Microcomputer Workshop
January 10, 1981

Gary B. Krause, Pierce
Lindsay Boggess, Pierce
R. W. Wechsler, Pierce
Frank Baugh, Pierce
Richard South, Pierce
R. D. Skidmore, Pierce
Barbara Crane, Mt. San Antonio
Herman Weskamp, Mt. San Antonio
Tom Visosky, Mt. San Antonio
C. M. Delameter, MiraCosta
William H. Thompson, MiraCosta
Joe Randolph, Antelope Valley
Frank Roberts, Antelope Valley
Jerry Sortomme, Santa Barbara
Tim Johnson, Santa Barbara
Nancy Scanlan, Orange Coast
Monte McKibban, Orange Coast
Brad Monroe, Cuyamaca
Ken Waters, College of the Desert
Doug Walker, College of the Desert
George Smith, College of the Desert
Will Wade, College of the Desert
Ed Boggess
Hop Estes

Sacramento Microcomputer Workshop
January 17, 1981

Laurn K. Beutler, West Hills
Howard Ramsden, Allen Hancock
Bill Justice, Shasta College
Bill Burrow, Shasta College
Owen Petersen, Butte
A. H. Turley, Butte
Dave DuBose, Shasta
Dale Rogers, Butte
Roger Beckett, Shasta
Quentin Nakagawara, Butte
Teresa Ginno, Butte
Dick Tontges, Shasta
Francis Duchi, Shasta
Warren Lytle, Shasta
Frank Hutchinson, Butte
Steve Mahoney, Shasta
Eric Christenson, West Hills
Howard Holman, Butte
Jim Ignatieff, Solano

Sacramento Microcomputer Workshop
January 24, 1981

Ted Bell, Santa Rosa
Jim Porter, Santa Rosa
Dave Cox, Diablo Valley
Robert Kennedy, Hartnell
Barry Friesen, Merritt
Larry Michel, Yuba College-Woodland
Doug Bentz, Butte
Yancey N. Juergensom, Modesto
Kevin Gamble, Durham High School
Gary Clausen, Merced
Edward Leal, Modesto
Hal Carlton, Modesto
Lamond Woods, Delta
Jim Beardsley, Delta
David Dias, Delta
Bart Ruud, Sierra
Ron Martinez, Sierra
Mimi Lufkin, Etna High School
Paul Finn, Santa Rosa
O. E. Thompson, U.C.D.
Ralph Mathews, C.C.C.
Marc Merman, CCSF
Eugene Duncan, CCSF
Hope Hanson, Yuba
Pat Folendorf, Merced
Don Brandt, Princeton